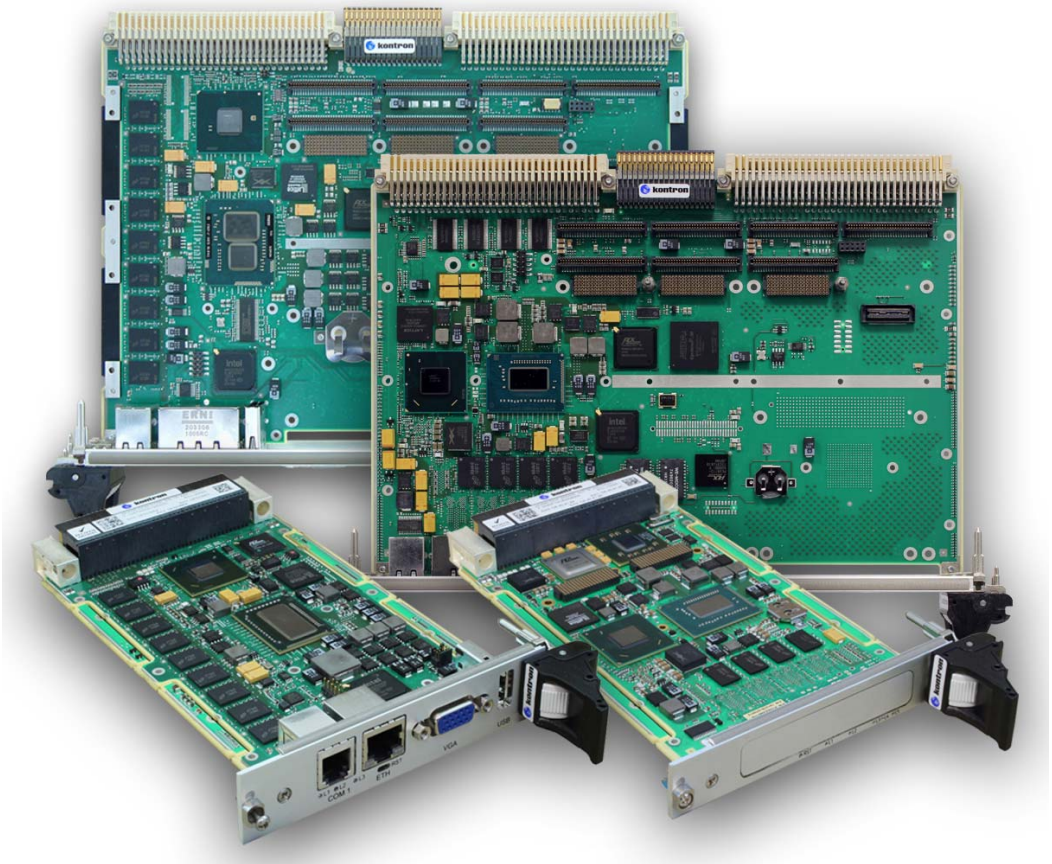
» VX304x, VX3035, VM6050 & VM6052/54 «



Release Notes Fedora 16
on VX304x, VX3035, VM6050 & VM6052/54
Version 3.4 - ID 15111

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Environmental protection is a high priority with Kontron.

Kontron follows the DEEE/WEEE directive.

You are encouraged to return our products for proper disposal.

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

- reduce waste arising from electrical and electronic equipment (EEE)
- make producers of EEE responsible for the environmental impact of their products, especially when they become waste
- encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE
- improve the environmental performance of all those involved during the lifecycle of EEE

Conventions

This guide uses several types of notice: Note, Caution, ESD.

Note: this notice calls attention to important features or instructions.

Caution: this notice alert you to system damage, loss of data, or risk of personal injury.

ESD: This banner indicates an Electrostatic Sensitive Device.

All numbers are expressed in decimal, except addresses and memory or register data, which are expressed in hexadecimal. The prefix `0x' shows a hexadecimal number, following the `C' programming language convention.

The multipliers `k', `M' and `G' have their conventional scientific and engineering meanings of $*10^3$, $*10^6$ and $*10^9$ respectively. The only exception to this is in the description of the size of memory areas, when `K', `M' and `G' mean $*2^{10}$, $*2^{20}$ and $*2^{30}$ respectively.

When describing transfer rates, `k' `M' and `G' mean $*10^3$, $*10^6$ and $*10^9$ *not $*2^{10}$ $*2^{20}$ and $*2^{30}$.*

In PowerPC terminology, multiple bit fields are numbered from 0 to n, where 0 is the MSB and n is the LSB. PCI and CompactPCI terminology follows the more familiar convention that bit 0 is the LSB and n is the MSB.

Signal names ending with an asterisk (*) or a hash (#) denote active low signals; all other signals are active high.

Signal names follow the PICMG 2.0 R3.0 CompactPCI Specification and the PCI Local Bus 2.3 Specification.

For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions

Warning!
All operations on this device must be carried out by sufficiently skilled personnel only.

Caution, Electric Shock!
Before installing a not hot-swappable Kontron product into a system always ensure that your mains power is switched off. This applies also to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair and maintenance operations with this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing work.

Special Handling and Unpacking Instructions

ESD Sensitive Device!
Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the board is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the board.

General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by Kontron and described in this manual or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This device should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This applies also to the operational temperature range of the specific board version, which must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the board, please re-pack it as nearly as possible in the manner in which it was delivered.

Special care is necessary when handling or unpacking the product. Please consult the special handling and unpacking instruction.

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Chapter 1 - Overview

Functional changes that differ from previous version of the document are identified by a vertical bar in the margin.

Linux, the Open Source Operating System is now taking a significant share of the OS market in Defense and Aerospace, after having taken ground initially in the enterprise server sector.

The goal of this document is to help you through the installation process of the Fedora 16 BSP distribution on the Kontron VX304x, VX3035, VM6050 & VM6052/54 boards.

In this document, the terms VX304x, VX3035, VM6050 and VM6052/VM6054 are used for the VX304x, VX3035, VM6050 and VM6052/VM6054 boards in standard or rugged conduction-cooled version:

VX304x 3U VPX Computing Node

- VX304x-SA Standard Commercial version
- VX304x-RC Rugged Conduction-Cooled version

VX3035 Single-slot 3U VPX board

- VX3035-SA Standard Commercial version
- VX3035-RC Rugged Conduction-Cooled version

VM6050 Single-slot 6U VME board

- VM6050-SA Standard Commercial version
- VM6050-RC Rugged Conduction-Cooled version

VM6052/VM6054 Single-slot 6U VME board

- VM6052-SA & VM6054-SA Standard Commercial version
- VM6052-RC & VM6054-RC Rugged Conduction-Cooled version

In this document, the terms VX304x-RTM, VX3035-RTM, VM6050-RTM and VM6052/VM6054-RTM are associated to the VX304x, VX3035, VM6050 and VM6052/VM6054 Rear Transition Module (RTM):

VX304x-RTM Rear Transition Module for the single-slot 3U VPX board

- PB-VX3-4xx

VX3035-RTM Rear Transition Module for the single-slot 6U VPX board

- PB-VX3-011

VM6050-RTM Rear Transition Module for the single-slot 6U VME board

- PBV36-P0-VM6-00

VM6052/VM6054-RTM Rear Transition Module for the single-slot 6U VME board

- PBV36-P0-VM6-00

Chapter 2 - Release Content

In this document the term Ki7 is used to refer to a board among the VX304x, VX3035, VM6050 & VM6052/54 boards.

The release is made of:

> **Fedora 16 x86_64 DVD for Ki7 boards**

This distribution includes the standard Fedora 16 Linux release as well as the BSP packages related to the Ki7 boards.

You can choose to install this distribution in a graphical configuration or in a serial console configuration.

> **Fedora 16 x86_64 LiveDVD for Ki7 boards**

The content of this distribution is identical to the previous one but the usage is different.

This distribution has a double role: at first it can be used in order to evaluate this new release without impacting the content of an onboard SATA disk.

Secondly, it allows you to install a LiveUSB flavor of Linux on the onboard SATA flash SSD or USB flash (stick).

The main interest of a LiveUSB installation is to preserve as much as possible the flash devices by limiting the writing cycles to them.

The Board Support Package (BSP) provides support for some specific features of the board:

> Kernel:	Update of the kernel of Fedora 16 to support Ki7 boards specifics features and to fix issues. Note that this kernel is required by the following features.
> Sensors:	CPU Cores and Board temperatures and voltages.
> Vital Product Data (VPD) Tool:	Get board's serial number, order code, E.C. Level, ...
> LEDs:	Four Front Panel Tri-color LEDs
> GPIO:	Driver to support the GPIOs of the Ki7 boards
> Watchdog:	Drivers to setup the Watchdogs of the board.
> BIOS Update tool:	A command and script to update the BIOS of the board.
> CPLD register Tool (cpldtool):	Tool to deal with hardware registers of the onboard CPLD
> FRAM support:	Driver and special API file to read/write from/to the FRAM
> Diskless:	Tool to configure, boot and manage diskless boards.
> PBIT report:	sysvartool gives the report of the PBIT.
> I2C buses drivers:	i2c bus drivers for the local i2c bus and the two backplane i2c busses.

The VXFabric product is delivered apart from the BSP.

More information on Ki7 boards BSP in Chapter 7 “BSP Specific Features” page 25.

Information on Fedora 16 is available at http://fedoraproject.org/

The 'Fedora 16 x86_64 DVD for Ki7 boards' contains Kontron source packages.

These packages are present in the 'SRPMS' folder.

Below an example of source packages available :

```
cpld-1.2-15111.src.rpm
e1000e-2.3.2-15111.src.rpm
hwtools-1.3.7-15111.src.rpm
ki7_bsp-3.4-15111.fc16.src.rpm
turbostat-1.0-1.fc16.src.rpm
cpld_smi-1.3-15111.src.rpm
flashrom-0.9.9-15111.src.rpm
ixgbe-3.18.7-1.src.rpm
sysvartool-1.7-15111.src.rpm
vmetoolkit-1.6-15111.src.rpm
cpldtool-1.5-15111.src.rpm
fmram-1.1-15111.src.rpm
kernel-3.4.9-15111.ki7.fc16.src.rpm
vpdtool-1.11-15111.src.rpm
```

Chapter 3 - Associated Documentation

Kontron Documentation

- Hardware
  - VX304x 3U VPX Computing Node User's Guide CA.DT.A98
  - VX304x Hardware Release Notes CA.DT.A99
  - VX3035 3U VPX SBC User's Guide CA.DT.A95
  - VX3035 Hardware Release Notes CA.DT.A96
  - VM6050 6U VME SBC User's Guide CA.DT.A93
  - VM6050 Hardware Release Notes CA.DT.A94
  - VM6052/VM6054 6U VME SBC User's Guide CA.DT.B16
  - VM6052/VM6054 Hardware Release Notes CA.DT.B17
- Firmware
  - VX304x BIOS User Manual SD.DT.F96
  - VX3035 BIOS User Manual SD.DT.F97
  - VM6050 BIOS User Manual SD.DT.F89
  - VM6052/VM6054 BIOS User Manual SD.DT.G34

Fedora 16 Documentation

- Documentation available at http://fedoraproject.org/

Chapter 4 - Required Configuration

4.1 Hardware Requirements

4.1.1 Hardware Requirements for VX304x Boards

> A Kontron VX304x board.

> The Fedora 16 release may be installed on one of the following bootable disks:

- a SATA disk connected to the SATA connectors available on VX304x-RTM board.
- an optional onboard USB Flash Disk.
- an optional onboard SSD Flash Disk

> A USB DVD-ROM device (for installation from DVD-ROM) or a USB Flash disk generated as described in chapter 11 “Additional Information” page 77.

> A graphical display (with mini DisplayPort interface), USB keyboard and USB mouse (for a graphics install)

OR

- A console on serial line (text or VNC install).

4.1.2 Hardware Requirements for VX3035 Board

> A Kontron VX3035 board.

> The Fedora 16 release may be installed on one of the following bootable disks:

- a SATA disk connected to the SATA connectors available on VX3035-RTM board.
- Optional onboard USB Flash Disk.

> A USB DVD-ROM device (for installation from DVD-ROM) or a USB Flash disk generated as described in chapter 10 “Create a USB Flash Disk from DVD Iso Image” page 76.

> Graphical display, USB keyboard and USB mouse (for a graphics install) or a console on serial line (text or VNC install).

4.1.3 Hardware Requirements for VM6050 Board

> A Kontron VM6050 board.

> The Fedora 16 release may be installed on one of the following bootable disks:

- a SATA disk connected to the SATA connectors available on VM6050-RTM board.
- Optional onboard USB Flash Disk.

> A USB DVD-ROM device (for installation from DVD-ROM) or a USB Flash disk generated as described in chapter 10 “Create a USB Flash Disk from DVD Iso Image” page 76.

> A console on serial line (text or VNC install).

For a graphic configuration on VM6050 a specific order code and a specific graphic module are required: VM6050-2SA34-12110 and MOD-GX-SA-00. The module provides two DP ports and a VGA connector.

4.1.4 Hardware Requirements for VM6052/VM6054 Board

> A Kontron VM6052/VM6054 board
> The Fedora 16 release may be installed on one of the following bootable disks:
  - a SATA disk connected to the SATA connectors available on the VM6052-RTM/VM6054-RTM board.
> A USB DVD-ROM device (for installation from DVD-ROM) or a USB Flash disk generated as described in chapter 10 “Create a USB Flash Disk from DVD Iso Image” page 76.
> a console on serial line (text or VNC install)

For a graphic configuration on VM6052/VM6054, a specific order code and a specific grapic module are required: VM6052-SA2x-x2xxx or VM6054-SA4x-x2xxx, and MOD-GX-SA-00. The module provides two DP ports and a VGA connector.

4.2 Firmware Requirements

4.2.1 VX304x Boards

The version of the BIOS firmware must be at least:

> 12332

This version is displayed in the BIOS Setup.

4.2.2 VX3035 Board

The version of the BIOS firmware must be at least:

> 12174

This version is displayed in the BIOS Setup.

4.2.3 VM6050 Board

The version of the BIOS firmware must be at least:

> 11332

This version is displayed in the BIOS Setup.

4.2.4 VM6052/VM6054 Board

The version of the BIOS firmware must be at least:

> 15034

This version is displayed in the BIOS Setup.

4.3 Software Requirements

> The DVD-ROMs:

- Fedora 16 x86_64 DVD for Ki7 boards
- Fedora 16 x86_64 LiveDVD for Ki7 boards

After the release is installed, the release version is saved in `/etc/ki7-release`:

```
# cat /etc/ki7-release
Ki7 Board Support Package 3.3 [14085]
```

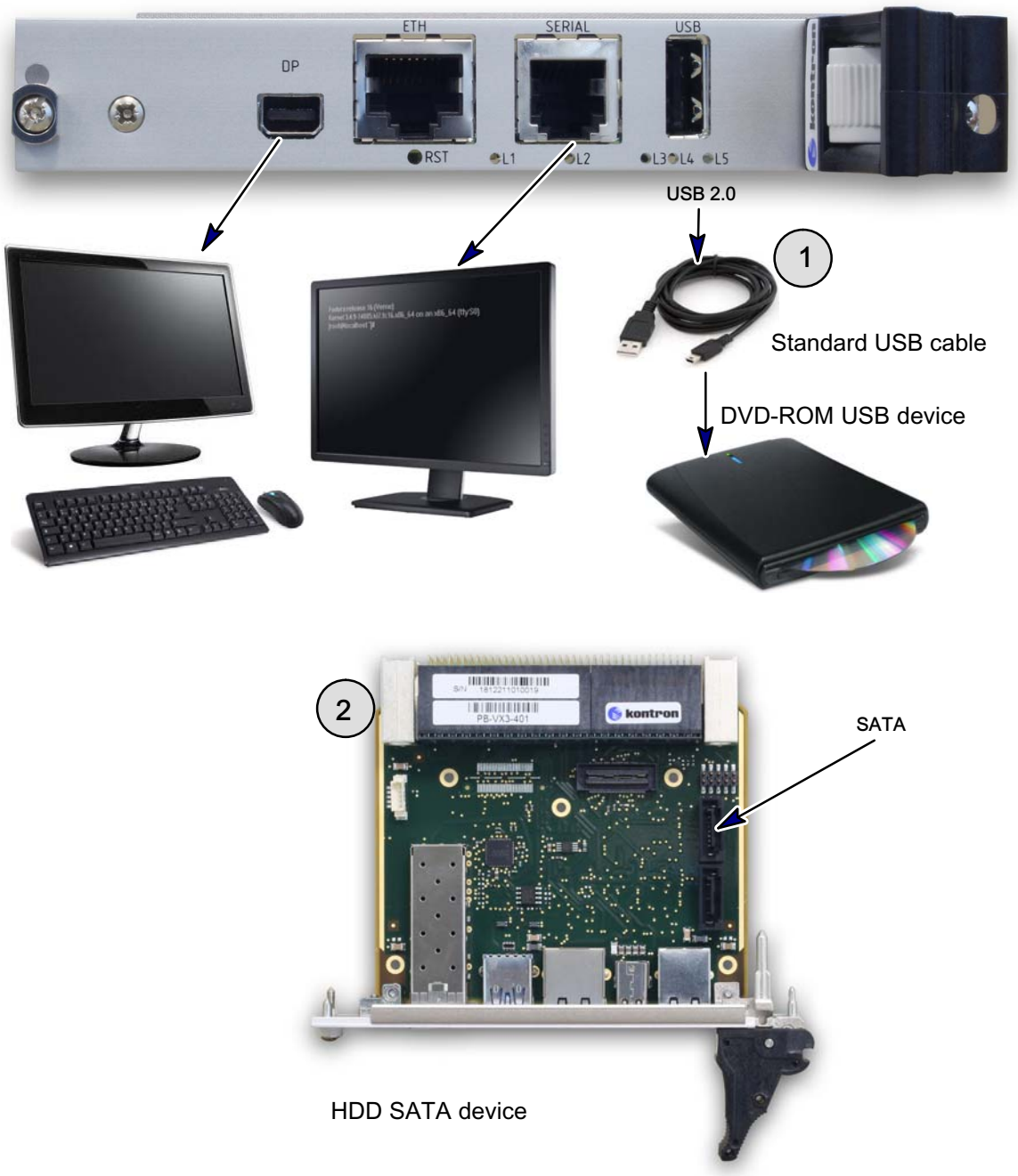
> ISO file image: the Kontron DVD can be delivered as ISO image format to customer.

To know how to create a USB flash disk from ISO image on Fedora 16, see chapter 10 “Create a USB Flash Disk from DVD Iso Image” page 76.

4.4 DVD-ROM Installation Example

4.4.1 DVD-ROM Installation Example for VX304x Board

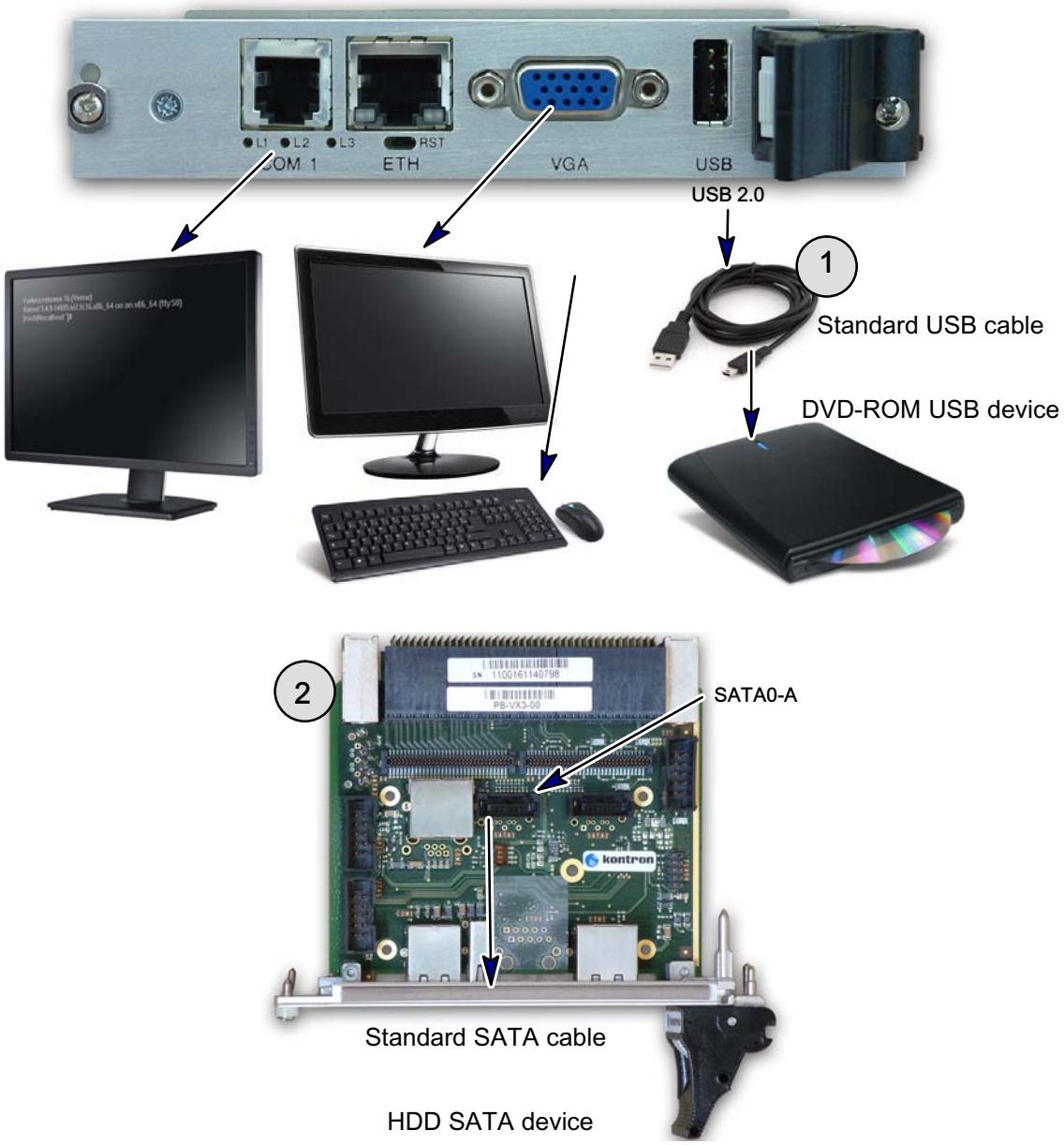
1. Plug a DVD-ROM USB device to the front panel USB connector using a standard USB cable.
2. Plug the HDD SATA device on the SATA0-A connector of the Rear Transition Module (VX304x-RTM).



Note There are 2 USB ports available: one on the front panel and the other one on the RTM board if an RTM is available. So in order to use a USB keyboard and a USB mouse plus a USB DVD-ROM, a USB HUB is required.

4.4.2 DVD-ROM Installation Example for VX3035

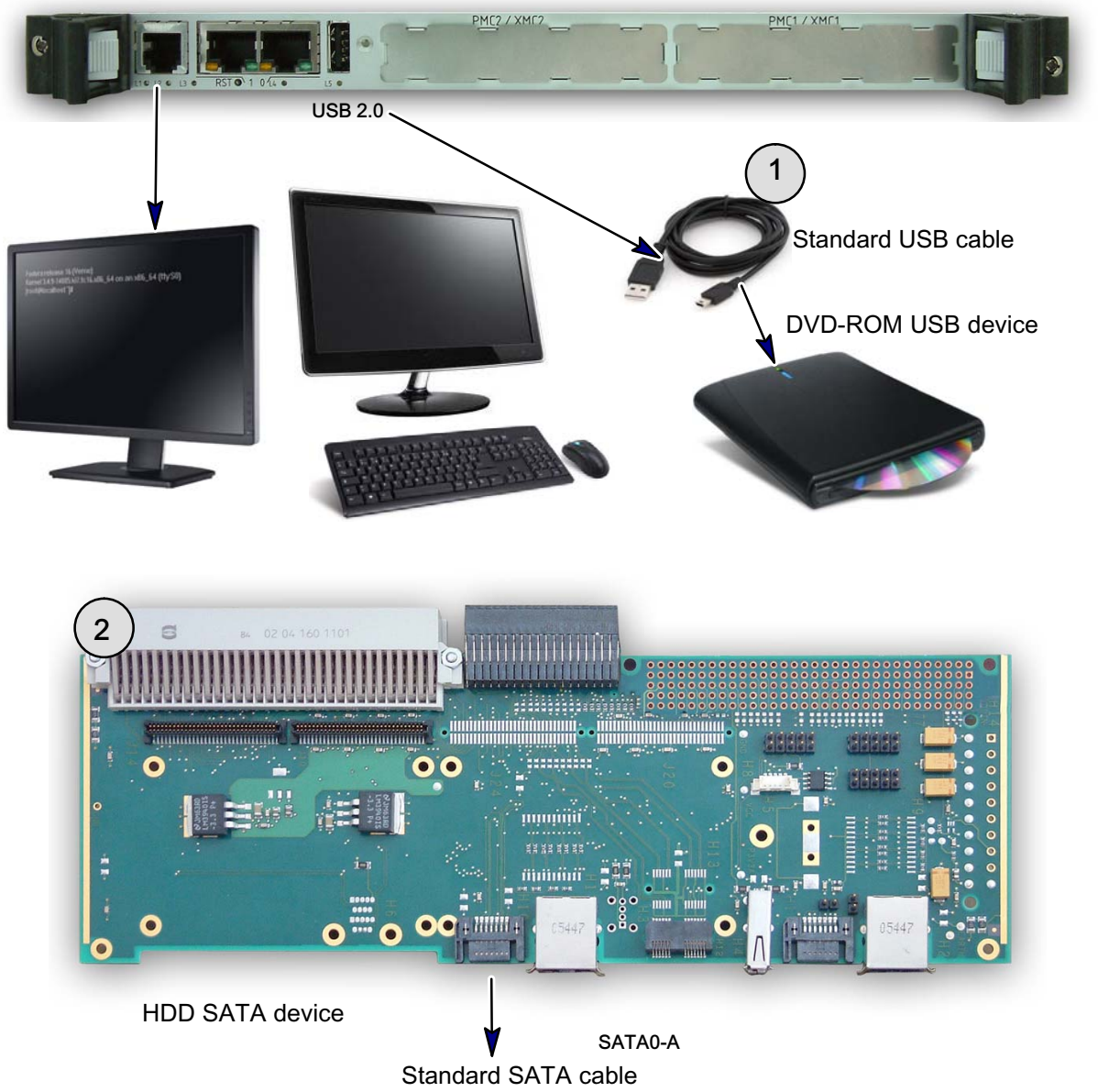
1. Plug a DVD-ROM USB device to the front panel USB connector using a standard USB cable.
2. Plug the HDD SATA device on the SATA0-A connector of the Rear Transition Module (VX3035-RTM).



Note There are 2 USB ports available: one on the front panel and the other one on the RTM board if an RTM is available. So in order to use a USB keyboard and a USB mouse plus a USB DVD-ROM, a USB HUB is required.

4.4.3 DVD-ROM Installation Example for VM6050

1. Plug a DVD-ROM USB device to the front panel USB connector using a standard USB cable.
2. Plug the HDD SATA device on the SATA0-A connector of the Rear Transition Module (VM6050-RTM).

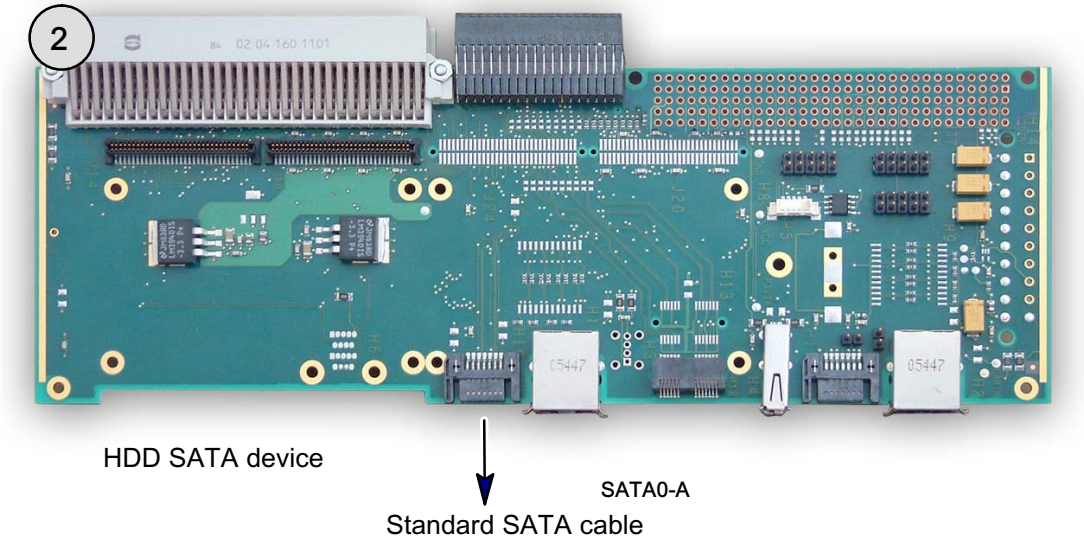


Graphic configuration on VM6050 requires a specific order code and a specific graphic module: VM6050-2SA34-12110 and MOD-GX-SA-00. The module provides two DP ports and a VGA connector.

There are 2 USB ports available: one on the front panel and the other one on the RTM board if an RTM is available. So in order to use a USB keyboard and a USB mouse plus a USB DVD-ROM, a USB HUB is required.

4.4.4 DVD-ROM Installation Example for VM6052/VM6054

1. Plug a DVD-ROM USB device to the front panel USB connector using a standard USB cable.
2. Plug the HDD SATA device on the SATA0-A connector of the Rear Transition Module (VM6052/VM6054-RTM).



Graphic configuration on VM6050 requires a specific order code and a specific graphic module: VM6050-2SA34-12110 and MOD-GX-SA-00. The module provides two DP ports and a VGA connector.

There are 2 USB ports available: one on the front panel and the other one on the RTM board if an RTM is available. So in order to use a USB keyboard and a USB mouse plus a USB DVD-ROM, a USB HUB is required.

Chapter 5 - Installation

This chapter describes the specific steps of the installation process of Fedora 16 on Ki7 boards.

5.1 Disk Installation

5.1.1 Fedora 16 DVD Menu

This section describes the options added to the installation menu on the Fedora 16 x86_64 DVD for Ki7 boards media.

When booting from this media, the following menu appears on the serial line (and also on the graphics display if present):

```
*                  Welcome to Fedora 16 ki7                    *
************************************************************
* Install or upgrade using GRAPHICS mode                     *
* Install or upgrade using SERIAL console                    *
* Install or upgrade using VNC                               *
* Install system with basic video driver                     *
* Rescue installed system using GRAPHICS mode                *
* Rescue installed system using SERIAL console               *
* Boot from local drive                                      *
* Memory test                                                *
*                                                            *
*                                                            *
*                                                            *
*                                                            *
************************************************************
```

Select one of these options :

> "`Install or upgrade using SERIAL console`": to do all the installation using the serial console. However in this mode, the disk partitioning cannot be customized and only a fixed very minimal set of 200 packages is installed. Depending on the needed services and libraries, some post installations may be required, so this is not the recommended method. If possible, install using VNC (see below) or using a graphics display.

> "`Install or upgrade using VNC`": to start the installation using the serial console, but then use a VNC client on another system to do the rest of the installation in graphics mode with all installation options available. This requires the network to be connected to the board.

When installing using the "`Install or upgrade using VNC`", the default behaviour is to use a DHCP server to provide the network settings to the board.

If no DHCP server is available, it is possible to provide these settings manually as follows:

> Move the cursor to the "`Install or upgrade using VNC` line"

> Press <tab> and append the network settings; at least the IP address :

```
> vmlinuz initrd=initrd.img console=ttyS0,115200 text stage2=hd:LABEL="Fedora" vnc
ip=172.20.144.95
```

or more settings :

```
> vmlinuz initrd=initrd.img console=ttyS0,115200 text stage2=hd:LABEL="Fedora" vnc
ip=172.20.161.201 netmask=255.255.255.0 gateway=172.20.161.46 dns=172.20.144.1
```

> and press <ENTER>

The following menu should be displayed (the Ethernet device list is an example):

```
Welcome to Fedora for x86_64

              ***************** Networking Device *****************
              *                                                   *
              * You have multiple network devices on this system. *
              * Which would you like to install through?          *
              *                                                   *
              *  eth0 - Ethernet device eth0 - 00:00:de:40:39:b5  *
              *  eth1 - Ethernet device eth1 - 00:00:de:40:39:b6  *
              *  eth2 - Ethernet device eth2 - 00:00:de:40:39:b7  *
              *  eth3 - Ethernet device eth3 - 00:00:de:40:39:b8  *
              *  eth4 - Ethernet device eth4 - 00:30:f7:98:2b:00  *
              *  eth5 - Ethernet device eth5 - 00:30:f7:98:2b:01  *
              *                                                   *
              *    ******        ************        ********     *
              *    * OK *        * Identify *        * Back *     *
              *    ******        ************        ********     *
              *                                                   *
              *                                                   *
              *****************************************************

  <Tab>/<Alt-Tab> between elements  | <Space> selects | <F12> next screen
```

Select the interface to use during installation to connect with the VNC client

```
Welcome to Fedora for x86_64

             ************* Disc Found *************
             *                                    *
             * To begin testing the media before  *
             * installation press OK.             *
             *                                    *
             * Choose Skip to skip the media test *
             * and start the installation.        *
             *                                    *
             *     ******           ********      *
             *     * OK *           * Skip *      *
             *     ******           ********      *
             *                                    *
             *                                    *
             **************************************

<Tab>/<Alt-Tab> between elements  | <Space> selects | <F12> next screen
```

Select `Skip` if you do not want to verify the validity of the media. At the end, the following messages are displayed:

```
Running anaconda 14.22, the Fedora system installer - please wait.
19:01:12 Starting VNC...
19:01:14 The VNC server is now running.
19:01:14

WARNING!!! VNC server running with NO PASSWORD!
You can use the vncpassword=<password> boot option
if you would like to secure the server.

19:01:14 Please manually connect your vnc client to 172.20.144.95:1 to begin the install.
Press <enter> for a shell
19:01:18 Starting graphical installation.
```

Then on a workstation, launch a VNC client to connect to the server running on the board. In the example above, the VNC server is 172.20.144.95:1

Then continue the installation process.

On a Fedora workstation, you can use the "TigerVNC Viewer" VNC client supplied with the distribution (can be launched from menu Application / Internet)

5.1.2 Fedora 16 Installation on Ki7 Boards

This section describes the installation procedure from a USB DVD-ROM drive.

There is no major difference between the installation on the Ki7 boards and the standard Fedora 16 installation, so refer to the Fedora documentation to get more details on all the Fedora installation menus.

Nevertheless, the Ki7 boards are a graphic board, so the installation may be done in graphic mode or in text mode on the serial port 0.

1. Insert the DVD Fedora 16 in the DVD-ROM driver.
2. After a board reset, or a board power-on, type **<F7>** to get the the Boot Manager Menu or **<F2>** to get the Setup from the BIOS and to select the DVD-ROM device as the boot device.
3. Select the installation method using the menu, as explained above.
4. Then the standard Fedora 16 Installer menus from anaconda should be displayed.
5. Proceed as a standard Fedora 16 installation.
6. Note that the mezzanine USB Flash device, if present, is probed as another SATA drive.
7. At the end of the installation, reboot on the installed disk drive through the Boot Manager Menu **<F7>**. The BIOS Setup menu should be used to set the boot devices priorities. Refer to the BIOS Manual - SD.DT.F96.

It is strongly recommended to disable the swap partition if the installation is done on a USB or SATA flash device.

5.1.3 LiveDVD Installation on SSD SATA Flash or USB Flash

The LiveDVD media allows to evaluate a new version of Linux in an easy way without degrading data present on local SATA disk or flash SSD disk.

Another usage of the LiveDVD is the creation of liveUSB on flash devices.

The main advantage of the liveUSB is to prevent, by default, all writing accesses to the flash disk (or USB stick). It is especially important for some USB flash (stick) or SSD SATA flash devices which do not tolerate a lot of writing cycles. However it is needed to be able to preserve some changes from one boot to the other one. The LiveUSB tool features this capability.

Creating a LiveUSB on the SSD flash disk implies the presence of the LiveDVD in the USB DVD-ROM drive.

At first, boot on the LiveDVD in the following way:

- Insert the Kontron LiveDVD into the USB DVD-ROM drive. You should also have a console connected to the serial port `ttyS0`.
- Under BIOS context, select the USB DVD-ROM drive as the first boot device.
- At the beginning of the boot step, a first menu should occur.
- Select the option:

  `Start FEDORA16 Ki7`

- At the end of the boot step notice the presence of a login on the console.

Using the `livecd-iso-to-disk` is the easiest way to create a LiveUSB image on a USB stick/SSD disk.

In case you use the media for the first time, you have to re-partition and format your media. To do this, use `fdisk`.

For example:

```
# fdisk /dev/sdX
n
Return
Return
Return
Return
t
6
p
w!
```

should create a unique partition which covers the whole media.

Then, reformat the media:

```
# mkfs.vfat -F 32 /dev/sdb1
```

Write the ISO image to the USB/SSD SATA flash disk using `livecd-iso-to-disk`:

```
# ./livecd-iso-to-disk --overlay-size-mb <OVERLAY_SIZE> --force --format /dev/sr0
/dev/sdX1
```

- Replace the reference `sdX1` by the right one in your particular case.
- Replace the field `<OVERLAY_SIZE>` by the value which fits your own configuration (1024 for example will reserve a 1 Gigabyte writable area).
- Press **<Enter>** to launch the process.

Then reboot the board and select the SSD device as new boot device this time.

A menu is displayed proposing 2 choices:

```
- Start FEDORA16 Ki7
- Troubleshooting
```

Choose `Start FEDORA16 Ki7`. As a result, you have access to a complete Fedora 16 x86_64 system including the BSP specific to the Ki7 board.

Of course, you might customize this system with your own changes. All these changes will be preserved in the overlay layer.

Chapter 6 - Fedora System Configuration

In this chapter, information related to some specific configuration items of the Fedora 16 system are detailed.

6.1 Network

6.1.1 Network Manager

With Fedora 16, the network interfaces are managed by the NetworkManager service by default.

For an embedded system, it is recommended to use the older network service instead which is easier to configure through configuration files.

For this:

> Disable the NetworkManager service:

```
[root@ki7]# chkconfig NetworkManager off
```

> Enable the network service:

```
[root@ki7]# chkconfig network on
```

> Stop the network manager: `service NetworkManager stop`
> Check the configuration files and modify them if needed :
  - `/etc/sysconfig/network-scripts/ifcfg-ethx` files
  - `/etc/resolv.conf`
  - `/etc/sysconfig/network`
> Start the network service: `service network start`
> Reboot if `/etc/sysconfig/network` has been modified

6.1.2 Udev Rule (only for VX304x and VM6052/VM6054)

Kontron **udev** rule exists to set the onboard Ethernet device name with **ethx** (where x is the interface number).

This rule is not applied by default and it is convenient only for users.

For example on VM6050/VM6052/VM6054 to set this rule, users need to type the following commands:

```
cp /etc/udev/rules/75-ki7.vm605x /etc/udev/rules/75-ki7.rules
dracut --force -I /etc/udev/rules.d/75-ki7.rules
```

The extension file of the **udev** rule indicates the name of the board. In this example '**vm605x**' is a **udev** rule for VM6050/VM6052/VM6054.

After relaunching the **udev** daemon or by rebooting the Linux distribution, the onboard Ethernet device name should be **eth0**,**eth1**,...

6.1.3 MAC Address

By default, the MAC address is stored with the configuration parameters of each interface. If the MAC address of a device is found different from the one expected (board changed for example), the interface is not brought up. This is not suitable for an embedded system when boards must be changed for maintenance without requiring additional configuration.

To workaround this behavior, do not bind an Ethernet interface to a MAC address:

> Run `system-config-network`

> For each interface:

- click on Edit
- click on Hardware Device tab
- unselect Bind to MAC address

> Exit from `system-config-network` saving changes

This can be done also by editing the `/etc/sysconfig/network-scripts/ifcfg-eth*` files and removing the `HWADDR` lines.

Removing `HWADDR` only works if the service network (and not NetworkManager) is used.

6.1.4 Firewall

If the firewall must be disabled but has been enabled during the installation:

> Run `system-config-firewall`, click on disable and exit

OR run

```
[root@ki7]# service iptables stop
[root@ki7]# service ip6tables stop
```

> Make sure to disable the iptables service by running:

```
[root@ki7]# chkconfig iptables off
[root@ki7]# chkconfig ip6tables off
```

> Reboot

6.2 SELinux

SELinux stands for Security-Enhanced Linux. The Security-Enhanced Linux kernel enforces mandatory access control policies that confine user programs and system servers to the minimum amount of privilege they require to do their jobs.

If you experience some trouble running some services or have some permission issues, try to set the System Default Policy to Permissive instead of Enforcing by running the `system-config-selinux` tool, or from command line doing as follows:

- disable on boot by editing `/etc/selinux/config` to set `SELINUX=permissive` instead of `SELINUX=enforcing`
- disable now: `setenforce 0`

6.3 GRUB Boot Loader

If your console is on the serial line and that access to the grub boot menu is not required on the graphics console, you should comment the following line in `/boot/grub2/grub.conf` if present :

```
terminal --timeout=5 serial console
```

This will prevent GRUB from waiting 5 seconds to let you select a console by typing a character on one console to select it.

This setting has nothing to do with the timeout on the boot menu that is set by the line

```
timeout=<value>
```

6.4 SATA Speed

Kontron introduce in the Ki7 BSP a file named /etc/grub.d/80_ki7 that contains the default value to append in the Linux command line.

By using this custom file, the standard Fedora comand "grub2-mkconfig -o /boot/grub2/grub.cfg" can be used for each kernel package update and also during the installation process.

By default the following parameters getfrom /etc/grub.d/80_ki7 are appended to each menu entry of the grub.cfg file located to /boot/grub2/grub.cfg:

```
APPEND_LINUX="pcie_aspm=off console=ttyS0,115200 vmalloc=512MB selinux=0
                        acpi_enforce_resources=lax"
```

All SATA interfaces of a Ki7 board are not speed limited.

The following line explain how to customize the /etc/grub.d/80_ki7 for having a specific speed for each SATA interface.

Once the file /etc/grub.d/80_ki7 is configured and a backup of the file /boot/grub2/grub.cfg is done, type as root privilege : "grub2-mkconfig -o /boot/grub2/grub.cfg."

To properly manage the SATA speed, first of all check at the BIOS setup that AHCI mode is enabled.

Futhermore, AHCI mode should allow the access to Hotplug option (refer to next chapter).

The current speed of the SATA ports may be checked at boot time by :

```
[root@ki7 ~]# dmesg | egrep ata[1-9]:
[    2.245738] ata1: DUMMY
[    2.248184] ata2: FORCE: PHY spd limit set to 3Gbps
[    2.253227] ata2: SATA max UDMA/133 abar m2048@0xf0b12000 port 0xf0b12180 irq 44
[    2.260605] ata3: DUMMY
[    2.263047] ata4: DUMMY
[    2.265490] ata5: FORCE: PHY spd limit set to 3Gbps
[    2.270531] ata5: SATA max UDMA/133 abar m2048@0xf0b12000 port 0xf0b12300 irq 44
[    2.277911] ata6: DUMMY
[    2.584377] ata5: SATA link up 1.5 Gbps (SStatus 113 SControl 310)
[    2.584411] ata2: SATA link up 1.5 Gbps (SStatus 113 SControl 310)
```

To set the speed of the ata2 bus to 3 Gbps and ata5 bus to 1.5 Gbps, modify the APPEND_LINUX entry in the /etc/grub.d/80_ki7 file :

```
APPEND_LINUX="pcie_aspm=off console=ttyS0,115200 vmalloc=512MB selinux=0
          acpi_enforce_resources=lax libata.force=2:3.0G,5:1.5G"
```

Once the file is modified type as root privilege :

```
[root@ki7 ~]# grub2-mkconfig -o /boot/grub2/grub.cfg
```

Reboot the machine to have these new settings applied at boot time.

```
[root@ki7 ~]# dmesg | egrep ata[1-9]:
[    2.245689] ata1: DUMMY
[    2.248133] ata2: FORCE: PHY spd limit set to 3.0Gbps
[    2.253177] ata2: SATA max UDMA/133 abar m2048@0xf0b12000 port 0xf0b12180 irq 44
[    2.260557] ata3: DUMMY
[    2.263001] ata4: DUMMY
[    2.265445] ata5: FORCE: PHY spd limit set to 1.5Gbps
[    2.270488] ata5: SATA max UDMA/133 abar m2048@0xf0b12000 port 0xf0b12300 irq 44
[    2.277867] ata6: DUMMY
[    2.584331] ata5: SATA link up 1.5 Gbps (SStatus 113 SControl 310)
[    2.607884] ata2: SATA link up 3.0 Gbps (SStatus 123 SControl 320)
```

It is mandatory for Ki7 to setup the SATA Speed of the onboard SSD Flash device to 1.5 Gbps.

In order to find the SATA bus number under Linux of the SSD Flash device type the following command:

```
[root@localhost ~]# dmesg | egrep GLS85
[    2.630945] ata5.00: ATA-8: GLS85LS1032A CS 32GBN A101D3, N A101D3, max UDMA/133
[    2.763694] scsi 4:0:0:0: Direct-Access     ATA      GLS85LS1032A CS  N A1 PQ: 0 ANSI: 5
```

In this case the `dmesg` indicates that the `GLS85LS1032A` with 32 GB is located to the ata5 bus, means SATA number 5.

To keep a 1.5 Gbps speed for this interface `libata.force=5:1.5G` parameter must be preserved when the file `/etc/grub.d/80_ki7` is customized.

6.5 SATA Hotplug

In AHCI mode, the SATA controller of the Ki7 boards provides a hotplug function. First of all this has to be setup at BIOS menus (Chipset->South Bridge Configuration->SATA Configuration). After the Hot Plug option is enabled for the SATA ports, boot the system.

» To remove a SATA device from the system:

Close all users of the device and backup device data as needed. Use `umount` to unmount any file systems that mounted the device.

Remove the device from any md and LVM volume using it. If the device is a member of an LVM Volume group, then it may be necessary to move data off the device using the `pvmove` command, then use the `vgreduce` command to remove the physical volume, and (optionally) `pvremove` to remove the LVM metadata from the disk.

If the device uses multipathing, run `multipath -l` and note all the paths to the device. Afterwards, remove the multipathed device using `multipath -f` device.

Run `blockdev --flushbufs` device to flush any outstanding I/O to all paths to the device. This is particularly important for raw devices, where there is no umount or vgreduce operation to cause an I/O flush.

Remove any reference to the device's path-based name, like `/dev/sd`, `/dev/disk/by-path` or the major:minor number, in applications, scripts, or utilities on the system. This is important in ensuring that different devices added in the future will not be mistaken for the current device.

Finally, remove each path to the device from the SCSI subsystem. To do so, use the command:

```
[root@ki7]# echo 1 > /sys/block/device-name/device/delete
```

where device-name may be `sde`, for example.

```
Nov 10 15:16:24 Ki7 kernel: [10018.256462] sd 1:0:0:0: [sdb] Synchronizing SCSI cache
Nov 10 15:16:24 Ki7 kernel: [10018.534156] sd 1:0:0:0: [sdb] Stopping disk
Nov 10 15:16:24 Ki7 kernel: [10018.934519] ata2.00: disabled
```

Then you can shut off the device.

» To add a SATA device:

When the system is up and running, power on the hotpluggable SATA device and the system should be warned that a new SATA device is available:

```
[root@ki7]# dmesg
...
Nov 10 15:22:40 Ki7 kernel: [10394.408164] ata2: irq_stat 0x00400040, connection status changed
Nov 10 15:22:40 Ki7 kernel: [10394.414149] ata2: SError: { RecovComm PHYRdyChg CommWake DevExch }
Nov 10 15:22:40 Ki7 kernel: [10394.420310] ata2: hard resetting link
Nov 10 15:22:43 Ki7 kernel: [10396.923493] ata2: SATA link up 3.0 Gbps (SStatus 123 SControl 300)
Nov 10 15:22:43 Ki7 kernel: [10396.925408] ata2.00: ATA-8: ST9160314AS, 0001SDM1, max UDMA/133
Nov 10 15:22:43 Ki7 kernel: [10396.925414] ata2.00: 312581808 sectors, multi 16: LBA48 NCQ (depth 31/32)
```

```
Nov 10 15:22:43 Ki7 kernel: [10396.927836] ata2.00: configured for UDMA/133
Nov 10 15:22:43 Ki7 kernel: [10396.927846] ata2: EH complete
Nov 10 15:22:43 Ki7 kernel: [10396.927991] scsi 1:0:0:0: Direct-Access ATA ST9160314AS\0001 PQ: 0 ANSI: 5
Nov 10 15:22:43 Ki7 kernel: [10396.928246] sd 1:0:0:0: Attached scsi generic sg1 type 0
Nov 10 15:22:43 Ki7 kernel: [10396.928299] sd 1:0:0:0: [sdb] 312581808 512-byte logical blocks: \
                                                                                (160 GB/149 GiB)
Nov 10 15:22:43 Ki7 kernel: [10396.928398] sd 1:0:0:0: [sdb] Write Protect is off
Nov 10 15:22:43 Ki7 kernel: [10396.928443] sd 1:0:0:0: [sdb] Write cache: enabled, \
                                                        read cache: enabled, doesn´t support DPO or FUA
Nov 10 15:22:43 Ki7 kernel: [10396.928772]  sdb: sdb1 sdb2
Nov 10 15:22:43 Ki7 kernel: [10396.955136] sd 1:0:0:0: [sdb] Attached SCSI disk
```

If automount services are enabled, the partitions should be mounted too.

6.6 VITA 57

Using VX3830 IO cards for VPX boards or VM6050, it is possible to use the VITA 57 option. Kontron is delivering a toolkit to help the setup and development of application using the onboard FPGA and the FMC modules defined though the VITA 57 standard. Refer to your representative to get more information about this option.

6.7 VXFabric

Kontron VXFabric™ is an open infrastructure which implements efficient inter board communication at hardware speed. The architecture is compliant with the OpenVPX standard (VITA 65) which defines two main hardware topologies of the backplane: distributed and centralized topologies.

To get more information about this software, go to the www.kontron.com web site and enter the key word "vxfabric" into the search engine.

Chapter 7 - BSP Specific Features

7.1 Sensors

7.1.1 Sensors Overview

The BSP contains an RPM named `sensors_addons` that configures the standard `lm_sensor` software for the Ki7 boards.

To display sensors information:

```
[root@ki7]# sensors
```

» Example on VX304x

```
[root@ki7]# sensors
acpitz-virtual-0
Adapter: Virtual device
temp1:        +37.0°C  (crit = +106.0°C)
temp2:        +36.0°C  (crit = +106.0°C)

nct7802y-i2c-22-28
Adapter: I2C CPLD adapter
 3V3 SB (A/D REF):    +3.24 V  (min =  +0.18 V, max =  +0.38 V)
 Processor Vcore  :   +0.86 V  (min =  +0.00 V, max =  +0.00 V)
 1V5 Memory       :   +1.52 V  (min =  +0.40 V, max =  +0.04 V)
 12V VPX VS1      :  +12.10 V  (min =  +0.13 V, max =  +1.34 V)
 5V  VPX VS3      :   +4.99 V  (min =  +0.78 V, max =  +1.15 V)
 VPX 3V3 aux      :   +0.00 V
nct7802y local temp:  +30.0°C  (low  = -40.0°C, high = +85.0°C)

coretemp-isa-0000
Adapter: ISA adapter
Physical id 0: +38.0°C  (high = +87.0°C, crit = +105.0°C)
Core 0:         +35.0°C  (high = +87.0°C, crit = +105.0°C)
Core 1:         +31.0°C  (high = +87.0°C, crit = +105.0°C)
Core 2:         +34.0°C  (high = +87.0°C, crit = +105.0°C)
Core 3:         +32.0°C  (high = +87.0°C, crit = +105.0°C)

pchtemp-pci-00fe
Adapter: PCI adapter
temp1:        +43.5°C
```

The sensor command reveals the presence of low, high and critical thresholds. When the temperature temp1 goes beyond the critical threshold, an automatic reset of the board will occur.

When the temperature or the voltage goes beyond one of the limits low and high, an explicit alarm message will occur in the sensors command output. So, in order to track down this kind of event, run the following command:

```
[root@ki7]# sensors | grep ALARM
```

On the other hand, it is possible to synchronize the execution of an application on a high limit temperature event.

For example, at first, create a file name `/tmp/test.sh` containing:

```
cd /sys/devices/platform/i2c-cpld.6/i2c-22/22-0028
cat < temp1_max_alarm_intr
echo ´Nuvoton local temp went beyond the high limit´
shutdown now
```

Make it executable and run it:

```
[root@ki7]# chmod +x /tmp/test.sh
[root@ki7]# /tmp/test.sh
```

As a consequence, in case the nuvoton temperature goes beyond the high limit temperature, this shell script will automatically cause a shutdown of the board.

7.1.2 Sensors Values Limitations

The sensors named "`acpitz-virtual-0`" has some limitations.

For these sensors, which are internal to the CPU, Intel does not guarantee the validity of temperature value in high level range of temperature.

The Kontron BIOS, to inform the user that the temperature probe validity is not correct, return the value -56°C.

So if a probe of these sensors value returns -56°C, it does not mean that the board is currently running at -56°C, but it only means that the probe value can not be reliable.

The sensor named "`pchtemp-pci-00fe`" has some limitations as indicated in the Intel documentations.

The temperature range of this sensors is approximately between 40°C to 130°C. Temperature below 40°C will be truncated to 40°C.

7.1.3 Temperature Sensors Threshold and Alarm Report

The LM73 and/or Nuvoton NCT7802Y have some minimum and maximum thresholds configured by the BIOS.

Linux drivers present in this distribution for these temperature sensors, implement a polling mechanism to report alarms.

Alarms are set by the driver, and reported by 'sensors' command.

When the temperature fetches on one of these sensor devices is lower than the minimum threshold the alarm is set and the 'sensors' command report '`ALARM (LOW)`'.

When the temperature fetches on one of these sensor devices is higher than the maximum threshold the alarm is set and the 'sensors' command report '`ALARM (HIGH)`'.

The interrupt mode is available only for the nct7802y by the module parameter '`nct7802y_smbalert`'.

This parameter is set at 0 that means the interrupt mode is not active.

If the interrupt mode is activated, the thresholds must be modified. It is necessary to fit the mode pre-configured by the BIOS. This mode set the interrupt when the temperature is higher than the maximum threshold, and unset the interrupt when the temperature is lower than the minimum threshold. In this case both threshold must have positive values.

The lower temperature threshold is a negative value.

The higher temperature threshold is a positive value

7.1.4 Voltage Sensors Threshold and Alarm Report

Only the Nuvoton NCT7802Y manages lower and higher limits.

Only the polling mode is implemented in the Nuvoton NCT7802Y device driver.

'`ALARM (MIN)`' is reported by '`sensors`' command when sensor value is lower than the minimum threshold.

'`ALARM (MAX)`' is reported by '`sensors`' command when sensor value is higher than the maximum threshold.

7.2 CPLD-WDT

NAME

cpld-wdt – Kontron board cpld_wdt watchdog driver

DESCRIPTION

This man page describes how to use the watchdog implemented by the cpld on various Kontron boards including the VX304x, VX3035 and VM605x families.

The principle of a watchdog is to automatically provoke some action after a given time passes without the watchdog being prodded by some process. This would indicate that the process is no longer working correctly. The cpld_wdt watchdog actions are to do nothing, to reset the board, to generate an interrupt that can wake up some other process, or to reboot. The prodding is done by writing to the watchdog device, which restarts the timeout.

The cpld_wdt module implements the standard Linux watchdog API, detailed in file **Documentation**/**watchdog**/**watchdog – api.txt** in the kernel source rpm. The supported features are described below.

Loading Module
There can be many devices and modules providing the watchdog API. Ensure only the cpld_wdt module is being used. For example, the standard iTCO_wdt watchdog module is usually blacklisted by a file in /**etc**/**modprobe.d**/ to avoid it being loaded.

The cpld_wdt module has to be explicitly loaded, for example by creating a systemd file with a name ending in ".conf" in /**etc**/**modules – load.d**/ listing the modules to load, one per line, for example:

```
cpld_wdt
```

Module Options
To provide initial options to the module, create a file with a name ending in ".conf" in /**etc**/**modprobe.d**/ holding a line such as:

```
options cpld_wdt timeout=50 trigger_mode=1 nowayout=1
```

The module options, shown by the command "modinfo cpld_wdt", include
timeout

the integer timeout in seconds, from 0 to 510 with a resolution of 2 seconds. The default is 30.

trigger_mode

the action to do when the timeout expires. An integer value

- 0 to simply countdown with no action,
- 1, the default, to reset the board,
- 2 to generate an interrupt that can be used to wake up a read on the device, or to reboot if no read is pending.

nowayout

an integer 1 if there is no way to stop the watchdog. The default is 0, which stops the timer if the magic character "V" is written just before the device is closed.

Usage from Scripts
The watchdog is implemented with the standard device /**dev**/**watchdog**. This file can accept ioctls to

configure the watchdog, but can be used simply from a shell script as follows: Load the module with the required configuration, for example to interrupt, with a timeout of 10 seconds:

```
[root@ki7]# rmmod cpld_wdt
[root@ki7]# modprobe cpld_wdt timeout=10 trigger_mode=2 nowayout=0
```

Start the watchdog by writing to the device:

```
[root@ki7]# echo >/dev/watchdog
```

Prod the watchdog faster than every 10 seconds:

```
[root@ki7]# while sleep 5; do echo >/dev/watchdog; done
```

After a while stop the loop and wait for a timeout:

```
[root@ki7]# cat /dev/watchdog
```

This will hang for 10 seconds. If you wait another 10 seconds without issuing another read, the OS will reboot. To stop the watchdog instead:

```
[root@ki7]# echo V >/dev/watchdog
```

To avoid the need to be root, simply change the ownership or permissions of /dev/watchdog.

Watchdog Ioctl API
The following standard ioctls are supported.
WDIOC_GETSUPPORT

```
#include <linux/watchdog.h>
struct watchdog_info ident;
ioctl(fd, WDIOC_GETSUPPORT, &ident);
```

returns in the structure the fields
identity

the driver identification ”cPLD WDT”

firmware_version

is always 1

options

describes the supported features, namely **WDIOF_KEEPALIVEPING** and **WDIOF_SETTIMEOUT**.

WDIOC_SETTIMEOUT

```
int timeout = ...;
ioctl(fd, WDIOC_SETTIMEOUT, &timeout);
```

sets the timeout in seconds.

WDIOC_GETTIMEOUT

```
ioctl(fd, WDIOC_GETTIMEOUT, &timeout);
```

returns the current timeout setting in the argument (not the dynamically changing counter value).

WDIOC_SETOPTIONS

```
int options = ...;
ioctl(fd, WDIOC_SETOPTIONS, &options);
```

configures the given options. These are **WDIOS_DISABLECARD** to disable the watchdog, and **WDIOS_ENABLECARD** to enable the watchdog.

WDIOC_KEEPALIVE

```
ioctl(fd, WDIOC_KEEPALIVE, 0);
```

prods the watchdog, restarting the countdown timer.

SEE ALSO

cpld(4)
cpldtool(1)

FILES

/dev/watchdog
Documentation/watchdog/watchdog – api.txt

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Kontron

7.3 VPD Tool

NAME

vpdtool – display Kontron board VPDs (Vital Product Data)

SYNOPSIS

–a *boardtype*
– –boardtype
– –conffile or –f *file*
– –eclevel
– –help or –h
– –human or –H
– –keylist
– –macaddr
– –serialnumber
– –variant

DESCRIPTION

vpdtool reads the VPDs (Vital Product Data) of many Kontron boards, including the following:

- ITC320/322 PENTXM2/4
- VM6050 VM6052 VM6054
- VM6250
- VX3020 VX3030 VX3035 VX3040
- VX3230 VX3240
- VX6060 VX6070 VX6080

As it reads hardware ports via /dev/mem you need to be root to run it.

OPTIONS

–**a** *boardtype*

forces the architecture of the board to that given, e.g. VX3020

– –**conffile or** –**f** *file*

uses the given features definition file. This file says how to convert the vpd binary encodings into text descriptions.

– –**help or** –**h**

prints an option summary.

– –**human or** –**H**

displays features of the board in a human readable way.

– –**boardtype** – –**eclevel** – –**keylist** – –**macaddr** – –**serialnumber** – –**variant**

displays only the requested information. The options can be combined.

EXAMPLE

```
$ sudo vpdtool – –human
VM6050 detected
```

```
 i2cbus_num = 22
Board type    : VM6050-2SA34-01110
EC Level      : EC02005
Serial Number: 1811401050021
Variant       : 1020004180850000
Keylist       : /PCB_B/SACLASS/P2GPIOOFF/BHQUAD/IOFPGAON/IBOMOFF/PCIEMUX-
GEN2/NOJTAGPCH/XMC/COREI7LVK0/PWRMAGOFF/BATON/STD_EARTH/IRTC/XDPON/STDCLK/
CK505REFOSC/XMCPWR12VOFF/2GB_DDR3_1333/P0PWRMAGOFF/P0UHM/SATAHDD/2RANK/VME/
PXMC/1SLOT/FP422ON/FL/P80OFF/ITIN/I2CSTD/P5VOFF/NOFPIO/PMCON/JTAGON/


Features      :
PCB B
SA Class
No GPIOs 7 & 8 on P2
Quad link NH82580
IO FPGA no DDR2 with FMC
Normal BOM generation
PCIe mux GEN2
PCH JTAG is not available on XDP connector
XMCA and XMCB equipped
Low Voltage 620LE Core-i7 2GHz K0
Front magnetic power option off
Battery present
Standard EARTH connection
PCH internal RTC configuration
XDP port available
Standard clock option
CK505 oscillator source configuration
5V XMC power rail
2GB DDR3-1333 device
P0 magnetic power option off
P0 type is UHM
SATA equipped for VM6250 HDD carrier
Both rank equipped
vme 2esst available
PMC P64s, XMC X8d+X12d IOs available
1 VME slot version for SA
Front panel RS-422 option on
Use of SnPb component only
P80 debug option not available on debug connector
PCB plating: Immersion Tin
CPLD I2C equipment: one F-RAM, one EEPROM
No P5V only
No front IO option
PMC connector fitted on board
JTAG connector fitted on board
```

FILES

/dev/mem
/dev/i2c/*

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Kontron

7.4 LEDs

The driver `leds_cpld` handles the front panel LEDs for user mode.

The driver `leds_cpld` creates a list of special files and classes in `/sys`:

```
[root@ki7]# ls /sys/class/leds/
led2:amber  led2:OFF  led3:amber  led3:OFF
led2:green  led2:red  led3:green  led3:red
```

For each LED, there are three different colors available: green, red, amber that can be set by addressing the related file.

For each color (which are exclusive), there are four different modes:

- ON (echo 0, see following example)
- slow blinking (echo 1, see following example)
- fast blinking (echo 2, see following example)
- OFF (echo 1, see following example)

Example, to set these different modes on the LED 2 in amber:

```
[root@ki7]# echo 0 > led2:amber/brightness The LED 2 is ON in AMBER
[root@ki7]# echo 1 > led2:amber/brightness The LED 2 blinks low in AMBER
[root@ki7]# echo 2 > led2:amber/brightness The LED 2 blinks fast in AMBER
[root@ki7]# echo 0 > led2:OFF/brightness The LED 2 is OFF
```

When setting led2 or led3, both led2 and led3 are set to user mode.

To exit from this mode, set led<n>:OFF/brightness to a non null value; for example

```
[root@ki7]# echo 1 > led2:OFF/brightness
```

> VX304x: On the front panel, the name of the led1 is L1, led2 is L2 and led3 is L3.

The led1 (L1 and L4) is not manageable at user level, so no special file for led1 is available.

7.5 Multinodes Diskless

Multinodes Diskless is a powerful set of python scripts to help the configuration of diskless root filesystems and to boot distant nodes through the Ethernet network (PXE).

The main command is `diskless`:

```
[root@ki7] diskless --help
```

There are two xml files to configure the diskless system:

`/etc/diskless/images.xml`: describes the layers, the nodes and main configuration setup.

`/etc/diskless/diskless_fs.xml`: lists the rpms used to build the root filesystem of the distant nodes;

The user manual is available at: `/usr/local/share/doc/diskless/pdf/manual.pdf`

If diskless is not needed, you can disable this service at boot time :

```
[root@ki7]# chkconfig diskless off
```

7.5.1 Introduction

When you have several Ki7 boards in your machine, you can use one of the board as a diskless server.

Most of the time, it will be the first board present in a chassis but it is not mandatory. It must be equiped with a SATA hard disk (or SATA SSD).

Of course, you won't need any disk media present on the other targets providing that the targets will boot on the diskless server through the network (that is the point).

The package multinodes-diskless is available to setup and configure a NFS exportable root filesystem and to get a kernel and a initrd bootable through PXE.

The diskless product is incompatible with SELINUX enforcing policy as well as iptables services.

So run the following commands in order to disable these services:

- Stop the iptables service and disable SELINUX by running the commands:

```
[root@ki7]# chkconfig iptables off
[root@ki7]# service iptables stop
```

- Set the variable SELINUX=disabled in the file: `/etc/selinux/config`

The following steps describe how to initialize a diskless configuration and how to boot it on a given number of targets.

7.5.2 Get the whole Fedora 16 Distribution on a Local Repository

The very first step is to get a local repository on the diskless server of the Fedora 16 RPM packages.

To do this, insert the Fedora 16 DVD and run these commands :

```
[root@ki7]# mkdir -p /dist/Fedora_16_ki7_boards/{BSP,RPMS}
[root@ki7]# mount /dev/dvd /mnt
[root@ki7]# cp /mnt/Packages/* /dist/Fedora_16_ki7_boards/RPMS
[root@ki7]# cd /dist/Fedora_16_ki7_boards
[root@ki7]# createrepo .
```

Then code the right value into the following field of the /etc/diskless/diskless_fs.xml:

```
<baseurl>file:///dist/Fedora_16_ki7_boards/</baseurl>
```

In this way the diskless tool will know the location of the Fedora 16 RPMs just installed.

The next step is to build a diskless root file system based on these Fedora 16 RPMs.

7.5.3 Build the diskless RFS (root file system)

Force the layer building even if it already exists by running:

```
[root@ki7]# diskless -B
```

The command will take a few minutes to complete.

The content of the RFS is defined in the section named <rpms> present in the xml file /etc/diskless_fs.xml

If you want change the content of the RFS, for example in order to add your own package, simply add the package name to the list.

Be careful when you change one of the xml files : /etc/diskless/images.xml or /etc/diskless/diskless_fs.xml . Keep a copy of the initial version.

You should notice the presence of two layers under /diskless/layers

```
[root@ki7]# ls /diskless/layers
fedora_base fedora_config
```

with

- fedora_base: Containing the reference root file system.
- fedora_config: A customizable layer you can change as you want.

For example, if you want to use your own /etc/hosts file, simply install it under /diskless/layers/fedora_config by running:

```
[root@ki7]# cp --parents /etc/hosts /diskless/layers/fedora_config
```

In this way, the target(s) after booting throught the network will "see" your own /etc/hosts file instead of the reference one (in fact, from the diskless client point of view, the layer fedora_config overloads the underneath fedora_base layer).

The RFS is now ready. The next step is to configure the DHCP server as well as the PXE boot.

7.5.4 Configure the DHCP and PXE Services in MAC Ethernet Address Mode

This step is mandatory to authorize remote targets to boot over the LAN on the diskless server.

Two modes are available for this purpose:

- MAC Ethernet mode: in this mode the IP address delivered by the DHCP server depends on the MAC Ethernet address of the target board.
- GEOID mode: in this mode the IP address delivered by the DHCP server depends on the location of the target board in the chassis.

This section presents the MAC Ethernet adress mode. The next one presents the GEOID Ethernet addres mode. Of course both of them are exclusive.

At first, uncomment if needed the XML structure called `<nodemap id="MAC_ADDR-diskless-cluster"..>` in the file `/etc/diskless/image.xml` and comment out the one related to the GEOID mode.

Then code the right MAC Ethernet address (related to the network interface used during the boot step) into this field:

```
<match criterium="macaddress">
<value>00:00:xx:xx:xx:xx</value>
</match>
```

From the server side, configure the network interface `em1` (for example) with the right address with the command:

```
[root@ki7]# ifconfig em1 192.168.1.1
```

If you want to use a different network base address, simply code this in the field `<ip>192.168.1.% (1+order.-value)</ip>` of the structure `<nodemap>`.

Start the required service `tftpd` by running the command:

```
[root@ki7]# chkconfig tftp on
```

Finally run the command:

```
[root@ki7]# diskless -x
```

Verify the right files have been created under `/diskless/tftp`:

```
[root@ki7]# cd /diskless/tftp
[root@ki7]# find .
```

The created files should be:

```
./pxelinux.0
./pxelinux.cfg
./pxelinux.cfg/default
```

Another impact of the `diskless -x` command is the starting of the DHCPD daemon.

So verify all worked well in this area by running:

```
[root@ki7]# service dhcp status
```

The output should include: `active` (running)

At this step, unless you want to configure diskless in GEOID mode, go directly to the section 7.5.6 - Export the Root File System.

7.5.5 Configure the DHCP and PXE Services in GEOID Ethernet Address Mode

An alternative to the MAC address mode is the GEOID mode. In this mode the IP address delivered by the DHCP server depends on the location of the target board in the chassis.

This mode is interesting in the sense that it allows you to replace a board by another one without changing the configuration file: `image.xml` (because the MAC Ethernet address, specific to each board, is not coded into the image.xml file in this case).

Indeed, in this case, it is required to code the GEOID range into the `image.xml` file instead of the explicit MAC addresses related to the boards plugged into the rack.

So edit the file `/etc/diskless/image.xml`, uncomment the right XML structure called `<nodemap id="GEOID-diskless-cluster"..>`... and comment out the one related to the MAC-ADDR mode.

Then, code the right GEOID value into this file (field `<match criterium="geoid">`).

In order to take into account the previous change, run the following command:

```
[root@ki7]# diskless -x
```

At this step, the DHCPD daemon should be ready as well as the TFTPD one.

7.5.6 Export the Root File System

The diskless RFS based on aufs (which implements the different stackable layers) must be exported now.

To do this, use this command:

```
[root@ki7]# diskless -e
```

Finally start the NFSD service with the command:

```
[root@ki7]# service nfs-server start
```

and verify the status is correct.

```
[root@ki7]# service nfs-server status | grep Active
```

At this step, the remote target should be ready to be booted in diskless mode.

Reboot the server to take into account the previous changes.

7.5.7 Boot the Target through the Network

On the diskless target and after a power-on, enter BIOS setup on CPUB by pressing <F2>.

Under BIOS Setup, select successively the menus: **Chipset ->South Bridge -> Ibex Peak Option** and enable the PXE boot (example given on VM6050).

Save the changes and after reset, press again **<F2>**.

Select the menu "**boot**" and put the network device at the top of the list.

Save the change and exit. As a result the PXE boot will happen and the following should be displayed:

```
CLIENT MAC ADDR: 00 00 DE 40 36 F9
GUID: 00020003 0004 0005 0006
000700080009
DHCP.|
```

You should notice the occurence of a login at the end of the boot step.

Log in as root and verify the system is operational.

7.5.8 Diskless Service

To automate the launching of the diskless at the boot step, simply enable the related service by running :

```
chkconfig diskless on
```

In this case, the next time you boot the server, the service `diskless` will be launched.

As result the commands `diskless -x` and `diskless -e` will be run automatically, authorizing the diskless boot of the target.

7.5.9 Initiate a Reset of the Remote Targets

```
[root@ki7]# diskless -aR
```

Should cause a reset of all the remote targets.

7.6 Sysvartool

To get the report of the PBIT (Power Built In Test), run the command:

```
[root@ki7]# sysvartool -A pbit -l
VX304x detected
 area = 2, arch = 2
POSTs configured to run from command line:
       mem_data: PASSED
       mem_addr: PASSED
   mem_pattern1: PASSED
   mem_pattern2: PASSED
   mem_pattern3: PASSED
   mem_pattern4: PASSED
    ether_loop0: PASSED (FAILED ONCE)
    ether_loop1: PASSED (FAILED ONCE)
    ether_loop2: PASSED
         system: PASSED

PASSED  : 10
FAILED  : 0
NOT RUN : 0
TOTAL   : 10

POSTs configured to run automatically from RAM:

PASSED  : 0
FAILED  : 0
NOT RUN : 0
TOTAL   : 0

POSTs configured to run automatically from ROM:

PASSED  : 0
FAILED  : 0
NOT RUN : 0
TOTAL   : 0
```

7.7 GPIOs

NAME

cpld-gpio - Kontron board gpio-cpld driver gpios

DESCRIPTION

This man page describes how to use the gpios implemented by the cpld on various Kontron boards including the VX304x, VX3035 and VM605x families.

The cpld gpio driver provides an API using files in the /sys filesystem. Reads and writes to the files are directly handled by the driver, provoking reads and writes of hardware registers. Reads normally return a short string terminated with a newline. Further reads need to seek back to the start of the file or re-open it. Writes should normally be of a single string, optionally terminated with a newline. Writing values other than those described below are undefined, but usually result in a write error with errno EINVAL Invalid argument.

Usage from Program
Operations can be easily done from a shell script. When used from a program, open the files for simultaneous read and write, except for ”intr_stat” (read only). Read in one go into a buffer big enough to accept the whole reply, including newline (i.e 11 characters). Use lseek(2) to rewind the file descriptor before each read. Write each value using a single system call. There is no need to lseek before writes.

Permissions
By default the files are owned by root and only writeable by the owner. If necessary, these ownerships and permissions can be changed (each time the driver is loaded), for example by a udev rule.

Sysfs Files
There is one directory per gpio, starting with gpio1, under the class directory:

/sys/class/cpld-gpio/

The number of gpios depends on the board. Each directory has the following files. The string values described are those that can be written, or will be read.

direction holds the value ”in” (incoming signal) or ”out” (outgoing). The default is ”in”. For example:

```
[root@ki7]# echo out >/sys/class/cpld-gpio/gpio4/direction
[root@ki7]# cat /sys/class/cpld-gpio/gpio4/direction
out
```

value holds the value ”0” (low signal) or ”1” (high). On read return the current value of the gpio. On write sets the value of an outgoing gpio. For example:

```
[root@ki7]# echo 0 > /sys/class/cpld-gpio/gpio4/value
[root@ki7]# cat /sys/class/cpld-gpio/gpio3/value
1
```

polarity holds the value ”hi” (interrupt when signal active on high level or rising edge), or ”lo” (active on low level or falling edge). The default is ”hi”.

mode holds the value ”edge” (interrupt on rising or falling edge) or ”level” (on high or low level). The default is ”edge”.

toggle holds the value ”on” (interrupt on any state change) or ”off” (interrupt only on the configured polarity and mode). When on it overrides the polarity and mode settings. The default is ”off”.

interrupt holds the value ”on” (enable interrupts) or ”off” (disable). When an interrupt occurs in level mode, this value is automatically reset to ”off” to avoid a permanent interrupt. The default is ”off”.

intr_stat is a read-only count of the number of interrupts received on the gpio. This is an unsigned 32 bit decimal value which can be up to 10 digits long, plus a newline. This file is read-only, and writing to it will result in a write error of EPERM Permission denied, or EIO Input/output error. For example:

```
$ cat /sys/class/cpld-gpio/gpio5/intr_stat
12
```

value_it on read waits for an interrupt on the gpio, and then returns a string of length zero. If interrupts have not been enabled, the file acts like the value file. The file acts like the value file for all writes.

To get an interrupt you must set the direction, polarity, mode, toggle and interrupt files appropriately, and then read value_it until it returns, or poll the intr_stat value until it changes.

Dual Purpose GPIO
On some boards, gpio2 is a dual purpose gpio which can also be used to generate a Maskable Reset. It is configured using cpld registers that can be set using cpldtool, or low level port accesses.

To check if the board provides this feature run the command:

```
[root@ki7]# cpldtool -a|grep MSKR2LOC
```

If MSKR2LOC is not found, gpio2 is not dual purpose. To configure gpio2 as a standard gpio which does not issue a local reset, on a VPX board:

```
[root@ki7]# cpldtool -f VPX_CONTROL MSKR2LOC 0
```

on a VME board:

```
[root@ki7]# cpldtool -f VME_CONTROL MSKR2LOC 0
```

or on either type of board specify the register by number instead:

```
[root@ki7]# cpldtool -f 0x70 MSKR2LOC 0
```

Use the same command with value 1 to restore the configuration. To do the same using low level port accesses, read the register and calculate the new value before writing it back. For example:

```
[root@ki7]# port 0x870
@0x870 = 0x1d
[root@ki7]# port 0x870 0xd
@0x870 <- 0x0d
[root@ki7]# port 0x870
@0x870 = 0x0d
```

SEE ALSO

cpld(4)
cpldtool(1)

FILES

/sys/devices/platform/cpld_gpios/cpld-gpio/gpio[1-8]

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Kontron

7.8 cpldtool

NAME

cpldtool – Kontron board cPLD register utility

SYNOPSIS

–a
–d *register*
–f *register fieldname hexvalue ...*
–i *register*
–s *register hexvalue*
–v

DESCRIPTION

This utility interprets, displays, and sets flags in registers of the cPLD on Kontron boards including the VX3230, VM6250, VX3030 and VX6060. The cPLD is a small device that controls some low–level aspects of the board. See cpld(4). You need to be root to access the device. **Do not change register values accept as advised by Kontron**.

OPTIONS

Registers should be given as a decimal number, or hexadecimal number prefixed by 0x, whereas register content hexvalues are always assumed to be hexadecimal, whether prefixed or not.

–a displays all registers and interprets the bitfield flags as appropriate.

–d *register* displays the current value of the given register.

–i *register* displays information on the given register, naming each bitfield and saying where it starts.

–s *register hexvalue* sets the given register to the given hexadecimal value.

–f *register fieldname hexvalue ...* sets the given register field by field. Each field is specified by field-name, as shown by option –i, and the hexadecimal value for that field.

–v more verbose output for the –a and –d options, detailing what some values mean.

EXAMPLES

Describe register 9:

```
[root@ki7]# cpldtool –i 9
Ref 0x9 – FLASH MEMORY PROTECT


Field name: Boot flash CS swap DIP (7)
Explanation:
Boot flash chip select configuration
 0 : Normal configuration
 1 : Rescue configuration
 ...
Field name: USER WP (3)
Explanation:
USER level WP hardware protection
 0 : No USER level WP correction
 1 : USER level WP active
```

Show the current value of fields in register 9:

```
[root@ki7]# cpldtool -d 9
Reg 0x9 - FLASH MEMORY PROTECT = 0x00
        Boot flash CS swap DIP=0x0
        Boot flash CS swap Valid#=0x0
        Boot both flash=0x0
        USER WP=0x0
        SYS WP=0x0
        VPD WP=0x0
        VPX NVMRO=0x0
```

Set the ”USER WP” bitfield in register 9:

```
[root@ki7]# cpldtool -f 9 'USER WP' 1
```

SEE ALSO

cpld(4)

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7.9 I2C Busses

The `cpld_i2c` driver is supporting the local i2c bus (I2C bus number 22) which is local to the board and used to address sensors and system eeproms.

There are also two other I2C busses routed to the backplane; the bus numbers are 23 and 24:

- `/dev/i2c-23` is the SMB bus connecting it to the I2C devices in the chassis (if any).
- `/dev/i2c-24` is the IPMB bus connecting all boards through the backplane

By default, those two busses are available only on the system controller.

It is possible to enable those busses on other slots by adding the option `force_i2c_extend=1` at the load of the module "`cpld`". Add this argument "`cpld.force_i2c_extend=1`" at the kernel command line to enable this option.

7.10 BIOS Update

The `flashrom` package provides a set of commands and scripts to update the BIOS of the boards.

To update the BIOS of the Ki7 boards, use the command `ki7updbios`:

Help command:

```
[root@ki7]# ki7updbios -h
usage:

/usr/local/sbin/ki7updbios <options> <bios image>
Script to update the BIOS on boards using flashrom tools.\n
Options:\n
-r Read the current BIOS in bios image file.\n
-w Update the BIOS image using the given bios image file.\n
-a Update the all BIOS eeprom.\n
[root@ki7]#
```

Read the current BIOS:

```
[root@ki7]# ki7updbios -r BIOS.bin
flashrom v0.9.4 on Linux 2.6.32.14-11035.vx304x.fc12.i686.PAE (i686), built with libpci 3.1.7,
GCC 4.4.2 20091027 (Red Hat 4.4.2-7), little endian
flashrom is free software, get the source code at http://www.flashrom.org

Calibrating delay loop... OK.
No coreboot table found.
Found chipset "Intel QM57", enabling flash write... OK.
This chipset supports the following protocols: FWH,SPI.
Found chip "SST SST25VF032B" (4096 KB, SPI) at physical address 0xffc00000.
Reading flash... done.
[root@ki7]# ls -ltr BIOS.bin
-rw-r--r-- 1 root root 4194304 2011-03-03 15:54 BIOS.bin
```

Write a new BIOS file:

```
[root@ki7]# ki7updbios -w vx304x_ID12xxx.bin
flashrom v0.9.4 on Linux 2.6.32.14-11035.vx304x.fc12.i686.PAE (i686), built with libpci 3.1.7,
GCC 4.4.2 20091027 (Red Hat 4.4.2-7), little endian
flashrom is free software, get the source code at http://www.flashrom.org

Looking for "bios"... found.
Calibrating delay loop... OK.
No coreboot table found.
Found chipset "Intel QM57", enabling flash write... OK.
This chipset supports the following protocols: FWH,SPI.
Found chip "SST SST25VF032B" (4096 KB, SPI) at physical address 0xffc00000.
Flash image seems to be a legacy BIOS. Disabling checks.
Erasing and writing flash chip... Done.
Verifying flash... VERIFIED.
```

Take care that if the system is booted from the RESCUE BIOS flash (refer to the BIOS user manual), the update of the BIOS using the **ki7updbios** command will update the RESCUE BIOS Flash which is not recommended.

The update of the BIOS through the **ki7updbios** command does not preserve the setup parameters of the BIOS. For deployement of a BIOS version with its own setup parameters, preset one board with the desired parameters, backup this using **ki7updbios -r**, and use this version of BIOS+ setup to be deployed on other similar boards.

7.11 FMRAM Example

The `fmram` packages gives an example of how access to the FMRAM device which may be used to save some customer data which needs to be backuped.

```
[root@ki7]# fmram -h
```

Usage `fmram` [options]
a tool to read or write the FerroMagnetic RAM

Options are :

`-h`	: this help
`-r <value>`	: read at offset <value> (default 0)
`-w <value>`	: write at offset <value> (default 0)
`-s <value>`	: data size to read or write (default 4)
`-f <filename>`	: file name used to store (optional) or read (mandatory) data

Example:

`fmram -w 0x10 -s 0x11 -f data_file` :
store 17 bytes read from data_file to the ferromagnetic RAM at offset 16

With src package, the C code of this command is delivered as an example.

7.12 VME

7.12.1 ALMAVME

NAME

almavme – Alma VME Linux toolkit driver API

SYNOPSIS

Kernel API (from a kernel driver)
#include <almavme.h>

int alma_pci_channel_alloc(char *name, u32 vmeaddr, unsigned long pciaddr, u32 size, u32 flag);
int alma_pci_channel_free(int id);
unsigned long alma_vme_channel_alloc(char *name, u32 vmeaddr, u32 size, u32 flag);
int alma_vme_channel_free(unsigned long address);
u32 alma_cpuadr_to_vmeadr ”(unsigned long address);

int alma_user_dma(u32 vmeaddr,unsigned long pciaddr,u32 size,u32 flags);
int alma_user_dma_mcast(u32 vmeaddr, unsigned long pciaddr,u32 size,u32 flags,u32 select);

int alma_get_vme(void);
int alma_free_vme(void);
int alma_ctrl(int command, int config);

int request_vmeirq(unsigned int vector, void *handler);
int free_vmeirq(unsigned int vector);
void alma_vmeintcontrol(unsigned int mask, unsigned int ienable);
int disable_vmeirq(u32 level);
int enable_vmeirq(u32 level);
int alma_vmeinterrupt(unsigned char level, unsigned char vector);
int alma_phys_mem_alloc(struct alma_phys_mem_object *phys_mem);
int alma_phys_mem_free(struct alma_phys_mem_object *phys_mem);

User Space API (from an application)
#include <linux/almavme.h>
int fd = open(”/dev/almavme”, O_RDWR);
if(fd<0){
perror(”Error opening the almavme device”);
exit(1);
}
alma_ioctl_arg_t alma_ioctl;
alma_ioctl.intr.level = 1;
alma_ioctl.intr.vector = 2;
int error = ioctl(fd, VMEIOCTL_VMEINTR_GEN, &alma_ioctl);
close(fd);

See the User Space sections below.

DESCRIPTION

This describes the kernel service calls available for VME device drivers or application development on Kontron platforms using the almavme driver for all boards equipped with Alma2e and Alma2f.

Alma2f provides a highly integrated single chip solution to interface a VME64 bus with 2eSST protocol (two-edge Source-Synchroneous Transfer) and a 32-bit 66 MHz PCI Bus. All bridge features are programmable from the PCI bus or the VME bus. See the Alma2f User Manual CI.DT.A00.

In the following, functions are described from the kernel point of view, and examples show how to call them from a user application.

User Space Ioctls
All ioctls take a command argument, and an appropriate struct as third argument. As **alma_ioctl_arg_t** is a union of most of the possible struct types, it can be used as a suitable third argument for most of the ioctls. The descriptions below assume the following usage:

```
alma_ioctl_arg_t A;
A... = ...;
ioctl(fd,command,&A);
```

VME Access
All accesses to or from the VMEbus go through the PCI32 bus and the PCI-to-VME bridge hardware. No specific windows (slave or master) are opened at load time by the almavme device driver (except for the slave window to access Alma register space (A16) that is inherited from the firmware setup on VMPCx and PN3 boards). See the ”Mapping Service Calls” section below on how to open slave or master windows.

Mapping Service Calls
alma_pci_channel_alloc

int alma_pci_channel_alloc(char *name, u32 vmeaddr, unsigned long pciaddr,u32 size,u32 flag)

This allocates a slave channel from the VME to the PCI (i.e. incoming accesses to the board). Up to 15 channels can be opened, 8 of them support 2ESST (see the 2ESST section). The parameters of the routine describe the VME-PCI channel:

name is the name of this channel. It can be up to 12 bytes long, including the final null char. It is only used to label this channel in the list of channels printed by the almavmechan(1) utility.

vmeaddr is the VME physical address where the board will respond on the VME. It must be aligned to a 1MB boundary and also to the rounded-up channel size.

pciaddr is the physical address generated on the board when the PCI/VME bridge responds to the vmeaddr address on the VME bus. The address can be in PCI-IO space, PCI-MEM space or DRAM space (the flag field defines which one is used). It must be aligned to a 1 MB boundary and to the rounded-up channel size.

size is the size of the channel. It must be a multiple of 1 MB and it is rounded up to a power of 2.

flag contains the options for the channel. Options are ’ored’ from the following:

MEFG_WRTPOST access is write posted (default NO)

VMEFG_READAHEAD access is read ahead (default NO)

VMEFG_LEBE_*xx* defines the little/big endian conversion mode (default is address coherency)

***** The pci space which is one of:

VMEFG_PCIIO access PCI-IO

VMEFG_PCIMEM access PCI-MEM

VMEFG_DRAM access DRAM (default).

***** The AM code, which is decoded on the VMEbus for this channel. The default is **VMEFG_AM_A32SDATA** (0x0D). An AM code is specified as either:

VMEFG_AM_*xxx* flags that predefine standard AM codes, or

VMEFG_AM_DIRECT ored with multiple AM selecting bitmasks. The bitmask 0x0FF00000 defines which AM[5..3] are valid and the bitmask 0x000FF000 defines which AM[2..0] are valid. Each acceptable value of AM[2..0], i.e. the eight values 0 to 7, is selected by setting a bit in the bitmask, (1<<12) for 0, (1<<13) for 1, etc. To simplify, the **VMEFG_AMSLV_***xxx* flags can be used when several AM codes must be decoded. This is below the defined set of available AMs:
A32 USER MBLT (AM 0x08) fg = 0x00201013
A32 USER DATA (AM 0x09) fg = 0x00202013
A32 USER PROG (AM 0x0A) fg = 0x00204013
A32 USER BLT (AM 0x0B) fg = 0x00208013
A32 SUPER USER MBLT (AM 0x0C) fg = 0x00210013
A32 SUPER USER DATA (AM 0x0D) fg = 0x00220013
A32 SUPER PROG (AM 0x0E) fg = 0x00240013
A32 SUPER BLT (AM 0x0F) fg = 0x00280013
A24 USER MBLT (AM 0x38) fg = 0x08001013
A24 USER DATA (AM 0x39) fg = 0x08002013
A24 USER PROG (AM 0x3A) fg = 0x08004013
A24 USER BLT (AM 0x3B) fg = 0x08008013
A24 SUPER USER MBLT (AM 0x3C) fg = 0x08010013
A24 SUPER USER DATA (AM 0x3D) fg = 0x08020013
A24 SUPER USER PROG (AM 0x3E) fg = 0x08040013
A24 SUPER USER BLT (AM 0x3F) fg = 0x08080013
A16 USER (AM 0x29) fg = 0x02002013
A16 SUPER (AM 0x2D) fg = 0x02020013
A16 LCK (AM 0x2C) fg = 0x02010013

A16 USER, A16 SUPER, A16 LCK can not be used to initialize a VME to PCI memory window due to the current driver window size definition that must be higher or equal to 1MB. A24 USER MBLT, A24 SUPER USER MBLT are identify as AM that present some transfer error. For these cases please contact the Kontron support.

This routine returns an identifier from 0 to 15 on success and -1 on failure. It can be called from user space with the ioctl() **VMEIOCTL_PCI_CHAN_ALLOC.**

alma_pci_channel_free

int alma_pci_channel_free(int id)

This is used by the VME driver to free a VME-PCI channel allocated by alma_pci_channel_alloc(). The parameter id is the channel identifier returned by alma_pci_channel_alloc(). It returns 0 on success, -1 on failure. It can be called from user space with the ioctl **VMEIOCTL_PCI_CHAN_FREE.**

alma_vme_channel_alloc

unsigned long alma_vme_channel_alloc(char *name, u32 vmeaddr, u32 size, u32 flag)

This allocates an outgoing master channel from PCI to VME. The parameters of the routine describe the desired PCI-VME channel:

name is the name of this channel. It can be up to 12 bytes long, including the final null char. It is only used to label this channel in the list of channels printed by the alma_vmechan utility.

vmeaddr is the VME physical address generated by the board. It must be aligned to 8 MB.

size is the size of the channel. It must be a multiple of 8 MB, and less than 256 MB.

flag contains the options for the channel. Options are 'ored' from the following:

VMEFG_WRTPOST access is write posted (default NO). It must be used with a BLT or MBLT channel.

VMEFG_READAHEAD access is read ahead (default NO). It must be used with a BLT or MBLT channel.

VMEFG_LEBE_*xx* defines the little/big endian conversion mode (default address coherency).

VMEFG_PCIIO access is from PCI-IO to VME (default is access from PCI-MEM to VME). There is no difference between PCI-MEM and PCI-IO.

AM code. One of the predefined **VMEFG_AM_*xxx*** flags. The default is **VMEFG_AM_A32SDATA** (0x0D AM code).

This routine returns the CPU physical address on success and -1 on failure. The CPU physical address to be used by the Operating System or a user program can be mapped using the routine mmap(). This routine can be called from user space with the ioctl **VMEIOCTL_VME_CHAN_ALLOC.**

alma_vme_channel_free

int alma_vme_channel_free(unsigned long address)

This is used by the VME driver to free a PCI-VME channel allocated by alma_vme_channel_alloc().

address is the pointer returned by alma_vme_channel_alloc().

This routine returns 0 on success and SYSERR on failure. It can be called from user space with the ioctl **VMEIOCTL_VME_CHAN_FREE.**

alma_cpuadr_to_vmeadr

u32 alma_cpuadr_to_vmeadr(unsigned long address)

This returns the VME address that can be used to get at the given cpu physical address, or -1 if not visible from the VME.

User Space Mapping Service

ioctl(fd, **VMEIOCTL_PCI_CHAN_ALLOC**, &A)

does alma_pci_channel_alloc(A.pcichan.name, A.pcichan.vmeaddr, A.pcichan.pciaddr, A.pcichan.-size, A.pcichan.flag)

ioctl(fd, **VMEIOCTL_PCI_CHAN_FREE**, &A)

calls alma_pci_channel_free(A.index)

ioctl(fd, **VMEIOCTL_VME_CHAN_ALLOC**, &A)

returns alma_vme_channel_alloc(A.vmechan.name, A.vmechan.vmeaddr, A.vmechan.size, A.vmechan.flag)

ioctl(fd, **VMEIOCTL_VME_CHAN_FREE**, &A)

calls alma_vme_channel_free(A.addr)

For example (from MasterSgl.c).

```
char *devName = "mychan";
alma_ioctl.vmechan.name = devName; // Name
alma_ioctl.vmechan.vmeaddr = aBaseAddr; // VME Physical Address
alma_ioctl.vmechan.size = PCIVME_BLKSIZE; // As small as possible (8 MB)
alma_ioctl.vmechan.flag = VMEFG_AM_A32UDATA;
physAddr = ioctl(fd, VMEIOCTL_VME_CHAN_ALLOC, &alma_ioctl);
if(physAddr==-1){
  printf("vmeOpen: VME channel open / VMEIOCTL_VME_CHAN_ALLOC fail:
```

```
%s\n",devName);
  return (ERROR);
}
virtualAddr = (unsigned long)mmap(0, PCIVME_BLKSIZE, PROT_READ |
PROT_WRITE,
                MAP_SHARED, fd, (off_t)(physAddr&0xFFFFFFFF));
if(virtualAddr==-1){
  printf("vmeOpen: VME channel open: mmap fail: %s\n",devName);
  ioctl(fd, VMEIOCTL_VME_CHAN_FREE, &physAddr);
}
```

DMA Operations

The VME/PCI bridge includes two physical DMA channels that can copy data between PCI and VME buses. DMA bounce buffers are allocated if necessary, i.e. if the flags say the source or destination area is a virtual address.

Note that by default each DMA transfer is 4 kB (a page). Contact Kontron for other possibilities.

alma_user_dma

int alma_user_dma(u32 vmeaddr,unsigned long pciaddr,u32 size,u32 flags)

This executes a dma between the given vmeaddr and a pci, cpu physical or user virtual address, depending on the flags. It returns 0 on success.

vmeaddr is the VME physical address.

pciaddr is by default the DRAM logical address and DMA buffers are allocated. If the flag VMEFG_DMA_PADDR is set, it is the cpu physical DRAM address and DMA buffers are not allocated, but the dart or iommu is programmed and the address converted to a pci bus physical address. If the flag VMEFG_DMA_PCIADDR is set, it is the pci bus physical DRAM address and DMA buffers are not allocated, and no change is made to the address, no dart or iommu entries are made.

size is the size of the transfer in bytes. It is divided by 4 kB to get the number of DMA transfers.

flags contains the options for the channel. Options are 'ored' from the following:

VMEFG_DMA_VMEPCI the DMA is VME read and PCI write (default is PCI read VME write)

VMEFG_LEBE_*xx* define the little/big endian conversion mode (default is address coherency)

AM code. One of the predefined **VMEFG_AM_***xxx* flags can be used. The default is VMEFG_AM_A32SDATA (0x0D AM code).

VMEFG_DMA_CHBKSIZ changes the number of VME cycles in each block (default is 8). Note that the maximum number of cycles in a block is 256 and that the number of cycles are numbered starting from 0 (0 = 1 cycle, 1 = 2 cycles, etc.). The number of cycles uses the bitmask 0x0000FF00, so the blocksize has to be shifted left 8 and then 'ored' with a flag. For example, to set 256 VME cycles in each block, 'or' ((256-1)<<8)|VMEFG_DMA_CHBKSIZ with the other flags. Usually performance is improved by increasing the blocksize.

This does as alma_user_dma() but uses 2ESST broadcast cycles. Flags should include VMEFG_AM_2ESST and VMEFG_XAM_A64BDCST. The select mask has a bit set for the geographic id of each remote board that should accept the broadcast (little-endian bits 1..21). See the section on 2ESST below.

User Space DMA Operations

ioctl(fd, **VMEIOCTL_DMA_START**, &A)

calls alma_user_dma(A.dma.vmeaddr, A.dma.data, A.dma.size, A.dma.flag).

ioctl(fd, **VMEIOCTL_DMA_START_MCAST**, &A)

calls alma_user_dma_mcast(A.mcast.vmeaddr, A.mcast.data, A.mcast.size, A.mcast.flag, A.mcast.-select). This feature is not available on Alma2f.

For example:

```
dma_arg.vmeaddr = strtoul(argv[1], NULL, 0); // VME address
size = strtoul(argv[2], NULL, 0);
dma_arg.dmaaddr = malloc(size); // DMA buffer
if (dma_arg.dmaaddr == NULL) {
  fprintf(stderr," Error allocating DMA buffer\n");
  exit(1);
}
dma_arg.size = size; // size
if (argc <= 3) // Optional channel
  dma_arg.flag = VMEFG_AM_A32SDATA|VMEFG_DMA_VMEPCI;
else
  dma_arg.flag = strtoul(argv[3],NULL,0);
printf(" VME Addr: 0x%x, DMA buf: 0x%p, Size: 0x%x, Flags: 0x%x\n",
                dma_arg.vmeaddr,dma_arg.dmaaddr, dma_arg.size, dma_arg.-
flag);
err = ioctl(fd, VMEIOCTL_DMA_START, &dma_arg);
if (err != -1) {
  unsigned int *ptr = (unsigned int *) dma_arg.dmaaddr;
  for (i = 0; i < dma_arg.size/28; i++) {
    printf("[0x%p] %x %x %x %x %x %x %x\n",
    ptr, ptr[0], ptr[1], ptr[2],
    ptr[3], ptr[4], ptr[5], ptr[6]);
    ptr += 7;
  }
}
```

Contiguous Memory Allocation

The following routines allocate and free the physically contiguous memory needed for dma.

alma_phys_mem_alloc

int alma_phys_mem_alloc(struct alma_phys_mem_object *phys_mem)

This allocates a contiguous physical memory area. In the phys_mem parameter, only phys_mem->size needs to be set to the requested size, which can be up to 64 Mbytes. It returns 0 on success, -1 on failure. It can be called from user space with the ioctl **VMEIOCTL_PHYSICAL_MEM_ALLOC.**

alma_phys_mem_free

int alma_phys_mem_free(struct alma_phys_mem_object *phys_mem)

This frees a previously allocated contiguous physical memory area. In the phys_mem parameter, only phys_mem->cpu_phys_addr needs to be set to the address of the physical memory area. It returns 0 on success, -1 on failure. It can be called from user space with the ioctl **VMEIOCTL_PHYSICAL_MEM_FREE.**

User Space Contiguous Memory Allocation

ioctl(fd, **VMEIOCTL_PHYSICAL_MEM_ALLOC**, struct alma_phys_mem_object *phys_mem)

calls alma_phys_mem_alloc(phys_mem).

ioctl(fd, **VMEIOCTL_PHYSICAL_MEM_FREE**, struct alma_phys_mem_object *phys_mem)

calls alma_phys_mem_free(phys_mem).

For example (taken from the almavmechan tool):

```
mem_obj.size = ...;
rc = ioctl(fd,VMEIOCTL_PHYSICAL_MEM_ALLOC,&mem_obj);
printf("0x%x\n",mem_obj.cpu_phys_addr);
mem_obj.cpu_phys_addr = ...;
rc = ioctl(fd,VMEIOCTL_PHYSICAL_MEM_FREE,&mem_obj);
```

Locking

The VME bus can be explicitly locked before one or more accesses are done. It must always be paired with a free. These routines return 0 on success. On the VM605x board, the VME bus should be locked before issuing a simgle VME access concurrently with VME DMA accesses.

alma_get_vme

int alma_get_vme(void)

alma_free_vme

int alma_free_vme(void)

User Space Locking

ioctl(fd, **VMEIOCTL_GET_VME**, 0)

calls alma_get_vme()

ioctl(fd, **VMEIOCTL_FREE_VME**, 0)

calls alma_free_vme().

For example:

```
void fcop_withcapturevmebus(u32 *dst, u32 *src, u32 size){
  int ret = ioctl(fd,VMEIOCTL_GET_VME,0); // Capture the VME Bus
  if (ret==0) {
    fcop(dst,src,size); // Do the job
    ret = ioctl(fd,VMEIOCTL_FREE_VME,0); // Release the VME Bus
  }
}
```

VME/PCI Bridge Configuration

Some parameters can be changed in the VME/PCI bridge, such as request level, release mode, and arbitration.

alma_ctrl

int alma_ctrl(int command, int config)

If command is **ACTL_GET_CONFIG** the config is ignored, and the current configuration is returned. If command is **ACTL_SET_CONFIG,** the given config becomes the new VME/PCI bridge configuration, and 0 is returned. The config format is the following (bit 0 is the LSB):

request level is coded in the 3 LSB: ALMACFG_REQLEVELx for level x (from 0 to 3 inclusive). The default value is level 3.

fair mode is coded in bit 3 (ALMACFG_FAIRMODE). If active, the VME/PCI bridge does not request the VME if another VME device requests it on the same level.

bus release mode is coded in bits 4..6 (ALMACFG_BUSREL_MSK). Four modes are supported: ALMACFG_BUSREL_ROR (release on request), ALMACFG_BUSREL_RWD (release when done), ALMACFG_BUSREL_ROC (release on clear) and ALMACFG_BUSREL_RNE (release never). The default mode is ALMACFG_BUSREL_ROR.

fair mode timeout is coded in bit 7 (ALMACFG_FAIRTIMEOUT).

system controller is coded in bit 17 (ALMACFG_SYS_CTRL). It is READ ONLY. If active, the VME/PCI bridge is the VME system controller.

arbitration type is coded in bit 16 (ALMACFG_ROT_PRIO). If the VME/PCI bridge is the system controller, this bit sets the arbitration type: 0 fixed priority, 1 rotating priority.

timeout is coded in bits 8..15 (ALMACFG_TIMEOUTMSK). If the VME/PCI bridge is the system controller, these bits are the timeout value in microseconds for data transfer on the VMEbus. For example, if the timeout is 120 and if there is no response to a VME request after 120 microseconds, the VME/PCI bridge will generate a bus error on the VMEbus.

VME speed is coded in bit 20 and 21 with **ALMACFG_SPEED**_*XXXX.* There are three modes: slow, medium and fast. It programs the device to different speeds for VME 2ESST cycles.

This routine can be called from user space with the ioctls **VMEIOCTL_SET_ALMACFG**

and **VMEIOCTL_GET_ALMACFG.** It is possible to get the VMEbus and release the VMEbus by software; alma_get_vme() gets the VMEbus and alma_free_vme() releases the VME bus. These routines can be called from user space with the ioctls **VMEIOCTL_GET_VME** and **VMEIOCTL_FREE_VME.**

User Space VME/PCI Bridge Configuration

ioctl(fd, **VMEIOCTL_SET_ALMACFG**, &A)

calls alma_ctrl(ACTL_SET_CONFIG,A.almacfg)

ioctl(fd, **VMEIOCTL_GET_ALMACFG**, 0)

returns alma_ctrl(ACTL_GET_CONFIG,0)

Read() and Write() Primitives

The VME driver read() and write() primitives offer direct user access to VMEbus space, using the AM code specified by the VMEIOCTL_SET_RWAM ioctl command. The DMA is used to do reads and writes without remapping of VME buffers in kernel or user space. /**dev**/**almavme** and any /**dev**/**vme***X* may be used to read/write on the VME. The usual lseek(2) system call can be used to change the vmeaddr.

User Space Read() and Write() Configuration

ioctl(fd, **VMEIOCTL_SET_RWAM**, &A)

sets the AM code to be used by the driver's read() and write() entry points from A.defam.

ioctl(fd, **VMEIOCTL_GET_RWAM**, &A)

returns in A.defam the current AM code used by the driver's read() and write() entry points.

For example:

```
vmeaddr = strtoul(argv[1],NULL,0); // VME address
size = strtoul(argv[2], NULL, 0);
buffer = malloc(size); // DMA buffer
```

```
if (buffer == NULL) {
   fprintf(stderr," Error allocating DMA buffer\n");
   exit(1);
}
if (argc <= 3) // Optional channel
   flags = VMEFG_AM_A32SDATA;
else
   flags = strtoul(argv[3],NULL,0);
printf(" VME Addr: 0x%x, DMA buf: 0x%p, Size: 0x%x, Flags: 0x%x\n",
                 vmeaddr, buffer, size, flags);
err = ioctl(fd, VMEIOCTL_SET_RWAM, &flags); // Set the AM
err = lseek(fd, vmeaddr, SEEK_SET); // Set vmeaddr offset
err = read(fd, buffer, size); // Read data into buffer
if (err != -1) {
  unsigned int *ptr = (unsigned int *) buffer;
  for (i = 0; i < size/28; i++) {
    printf("[0x%p] %x %x %x %x %x %x %x\n",
      ptr, ptr[0], ptr[1], ptr[2],
      ptr[3], ptr[4], ptr[5], ptr[6]);
    ptr += 7;
  }
}
```

Interrupt Service Calls

The VME driver associates interrupt vectors with handlers by calling the routines request_vmeirq() and free_vmeirq(). The VME irq level may be masked/unmasked using alma_vmeintcontrol().

request_vmeirq

int request_vmeirq(unsigned int vector, void *handler)

Assign a handler to a specific VME vector. If the vector is between 8 and 15, it is for an addressed interrupt (see below). Otherwise, it is a VME irq vector from 0 to 255.

free_vmeirq

int free_vmeirq(unsigned int vector)

Release the specified vector.

alma_vmeintcontrol

void alma_vmeintcontrol(unsigned int mask, unsigned int ienable)

This masks or unmasks one or several interrupt levels.

mask is a 16 bit bitfield where each bit is associated with an interrupt level except bit 0. Bit n corresponds to the interrupt level n on the VMEbus.

ienable is 0 to mask and non-zero to unmask all the interrupt levels set in mask.

disable_vmeirq

int disable_vmeirq(u32 level)

This deprecated routine disables a single VME interrupt level, from 1 to 7.

enable_vmeirq

int enable_vmeirq(u32 level)

This deprecated routine enables a single VME interrupt level, from 1 to 7.

alma_vmeinterrupt

int alma_vmeinterrupt(unsigned char level, unsigned char vector)

This sends an interrupt on the VMEbus. Vector must be a multiple of 8. The interrupt vector generated is (vector+level).

User Space Interrupt Service

ioctl(fd, **VMEIOCTL_VMEINTR_GEN**, &A)

calls alma_vmeinterrupt(A.intr.level,A.intr.vector)

ioctl(fd, **VMEIOCTL_VMEINTR_CTRL**, &A)

calls alma_vmeintcontrol(A.intrctl.mask,A.intrctl.enable)

ioctl(fd, **VMEIOCTL_VMEIOINTSET**, &A)

connects interrupt A.vector to the VME driver, and returns an identifier that can be used with VMEIOCTL_INTRWAIT and VMEIOCTL_VMEIOINTCLR.

ioctl(fd, **VMEIOCTL_VMEIOINTCLR**, &A)

disconnects interrupt A.index from the VME driver.

ioctl(fd, **VMEIOCTL_INTRWAIT**, &A)

waits for an interrupt connected by VMEIOCTL_VMEIOINTSET. A.index is the identifier returned by VMEIOCTL_VMEIOINTSET.

For example, generating an interrupt:

```
lvl = strtol(argv[1], NULL, 0); // VME IRQ level
vect = strtol(argv[2], NULL, 0); // VME vector
printf("Level = 0x%lx, Vector = 0x%lx\n", lvl, vect);
alma_ioctl.intr.level = (u32) (lvl&0xFFFFFFFF);
alma_ioctl.intr.vector = (u32) (vect&0xFFFFFFFF);
err = ioctl(fd, VMEIOCTL_VMEINTR_GEN, &alma_ioctl);
```

For example, waiting for an interrupt:

```
lvl = strtol(argv[1], NULL, 0);
vect = strtol(argv[2], NULL, 0);
alma_arg.vector = (vect&0xFF); // Vector
printf("Init handling for interrupt level %d and vector 0x%x (0x%x)\n",
       lvl, vect, alma_arg.vector);
fflush(stdout);
Id = ioctl(fd, VMEIOCTL_VMEIOINTSET, &alma_arg);
// Enable the interrupt lvl
alma_arg.intrctl.mask = (1 << lvl); // VME IRQ level
alma_arg.intrctl.enable = 1; // Enable the IRQ
err = ioctl(fd, VMEIOCTL_VMEINTR_CTRL, &alma_arg);
printf("Wait for interrupt level %d (vector 0x%x) id=%d...\n", lvl, vect,
Id);
fflush(stdout);
alma_arg.index = Id; // Id in the user vector table
err = ioctl(fd, VMEIOCTL_INTRWAIT, &alma_arg);
printf("RECEIVED\n");
fflush(stdout);
```

```
// Disable the interrupt lvl
alma_arg.intrctl.mask = (1 << lvl); // VME IRQ level
alma_arg.intrctl.enable = 0; // Disable the IRQ
err = ioctl(fd, VMEIOCTL_VMEINTR_CTRL, &alma_arg);
printf("Disable VME IRQ level %d\n", lvl);
alma_arg.index = Id; // Id in the user vector table
err = ioctl(fd, VMEIOCTL_VMEIOINTCLR, &alma_arg);
```

Addressed Interrupts

There is another way to transmit an interrupt across the VMEbus using addressed interrupts. A byte write into a special register of the VME/PCI bridge will generate an interrupt on the board. A driver can choose to discriminate between eight different sources of addressed interrupts. The VME/PCI bridge registers can be accessed from the VMEbus in A16 mode. The A16 base address is setup by firmware (VMEID) on a 256 byte boundary, and extends for 256 bytes. To generate an addressed interrupt, write a byte at address (ALMAbase + 0xEE). The byte should have a value of (1<<x), where x is from 0 to 7 inclusive, chosen by the programmer. To receive addressed interrupts use request_vmeirq().

For example:

```
vmea16_addr = strtol(argv[3], NULL, 0); // VME A16 addr
printf("Adressed VME interrupt %ld remote A16:0x%lx\n", lvl-8,
vmea16_addr);
alma_ioctl.vmechan.name = "GENintr"; // Name
alma_ioctl.vmechan.vmeaddr =  0; // VME Physical Address
alma_ioctl.vmechan.size = PCIVME_BLKSIZE; // As small as possible (8 MB)
alma_ioctl.vmechan.flag = VMEFG_AM_A16S;
physaddr = ioctl(fd, VMEIOCTL_VME_CHAN_ALLOC, &alma_ioctl);
vaddr = (unsigned long) mmap(0, vmea16_addr + 0x100 /*size of A16 window*/,
  PROT_READ | PROT_WRITE, MAP_SHARED, fd, (off_t)(physaddr&0xFFFFFFFF));
if(vaddr==-1){
   printf("A16 VME channel open fail\n");
   ioctl(fd, VMEIOCTL_VME_CHAN_FREE, &physaddr);
   exit(1);
}
printf("VME_addr:0x%lx paddr:0x%lx vaddr:0x%lx\n", vmea16_addr, physaddr,
vaddr);
write_addr = (char*) (vaddr + vmea16_addr + 0xee);
write_val = (char)(1<<(lvl-8));
printf("WRITING 0x%x at 0x%p\n", write_val, write_addr);
*write_addr = write_val;
sync();
printf("READING 0x%x at 0x%p\n", *write_addr, write_addr);
sync();
munmap((void *)vaddr, 0x100); // size of A16 window
ioctl(fd, VMEIOCTL_VME_CHAN_FREE, &physaddr);
```

Further IOCTL() Commands
The following commands are also available:

ioctl(fd, **VMEIOCTL_VME_CHAN_GETIO**, struct pcivme_window *p)

copies the PCI-IO to VME channel descriptions into the third arg. It is N structures of type struct pcivme_window, where N is the number of PCI-IO to VME channels opened.

ioctl(fd, **VMEIOCTL_VME_CHAN_GETMEM**, struct pcivme_window *p)

copies the PCI-MEM to VME channel descriptions into the third arg. It is N structures of type struct pcivme_window, where N is the number of PCI-MEM to VME channels opened.

ioctl(fd, **VMEIOCTL_VME_CHAN_GETNB**, &A)

returns in A.vmechannb.mem the number of PCI-MEM to VME channels opened and in A.vmechannb.io the number of PCI-IO to VME channels opened.

ioctl(fd, **VMEIOCTL_PCI_CHAN_GET**, struct vmepci_window *p)

copies the VME to PCI channel descriptions into the third arg. It is 7 structures of type struct vmepci_window.

ioctl(fd, **VMEIOCTL_PCI_CHAN_GETEXT**, struct vmepci_window *p)

copies the VME to PCI channel descriptions into the third arg. It is MAXVMEPCIWIN structures of type struct vmepci_window.

ioctl(fd, **VMEIOCTL_SET_BOARDID**, int *ga)

set the GA (Geographical Address) for opening an A16S VME window pointing the the Alma bridge registers. Note that if the 'ga' value is equal to 0xff, the current GA of the board is not modified. Furthermore if 'ga' equal to -1 than this window is closed.

Sysfs Files

The driver provides files under the sysfs "vme" class directory, `/sys/class/vme/almavme.` These can be read or written.

/sys/class/vme/almavme/vme_bus_error
A read of this file returns as a string the number of VME bus errors seen by the driver. Any write will clear the counter.

2ESST
The Alma PCI/VME bridge implements 2ESST (Two Edge Source Synchronous Vme Transfer). This is an extension to the VME64 standard to allow the VME bus to operate at much greater speeds of nominally 160, 267 and 320 Mbytes/second, between boards supporting the extension.

2ESST transfers use a new address modifier (AM) code, and so are ignored by boards that do not support them. The supervisory/non-privileged and program/data sub-modes are replaced by a new extended address modifier (XAM). The data transmitter uses both edges of the clock to strobe data and does not wait for any acknowedgement (two edge source synchronous). 64 bits (8 bytes) of data are clocked on each edge. Transmissions must use an even number of edges, so the minumum unit of transfer is 16 bytes, though it is possible to flag the last cycle as ignored. It is not optimal to transfer only 16 bytes of data. A maximum of 128 beats of 2 edges of 8 bytes, ie 2048 bytes is allowed per transfer.

The initiator specifies in a three-part setup phase the maximum transfer rate. The slave can terminate the transfer with an error if it is unable to perform at this rate. It can also suspend the transfer if it does not currently have the resources, and the transfer will be retried later. The address transferred during setup phase does not specify the low 4 bits, so addresses are always aligned on 16 bytes.

There are physical limitations imposed by the distance between boards, the length of the backplane, and the effect of other boards in the rack, including a broadcast selecting many boards or not, so 2ESST transfers might work in one direction, and not in the reverse direction between the same two boards. For example, the maximum speed of 320 Mbytes/second might only be possible in a rack of 6 slots, with only 4 boards in place.

The Alma bridge provides 8 extra VME slave channels, for incoming VME accesses, allocated by the usual alma_pci_channel_alloc() routine when the VMEFG_AM_2ESST flag is used. These can be used for 2ESST accesses or ordinary accesses. (The first 8 VME channels cannot be used for 2ESST).

The maximum 2ESST rate that a channel will accept can be specified. Higher rates will cause the transfer to fail. The XAM must also be given and must match that used for the dma transfer.

2ESST transfers can only be generated by dma using the usual alma_queue_dmalist() routine, or alma_user_dma() its broadcast version alma_user_dma_mcast(). They must be targeted to a 2ESST window with the same AM, XAM, and the same or a higher rate.

The rate chosen for the dma can be throttled globally to a lower value by ioctl VMEIOCTL_SET_ALMACFG or kernel service alma_ctrl(), or the almavmechan(1) option –setalmastate.

Addresses for 2ESST dma must be aligned on 16 bytes.

The 2ESST protocol also provides for a broadcast transfer, where one board can do a single write that is received simultaneously by several boards. The boards to receive the broadcast are selected during the address phase by their geographic id. Broadcast AM therefore need to provide a bitmask selecting the remote boards that are to receive the write. Each board has a geographic id which is the slot number in which it is positioned. The bitmask is an ”or” of 1<<n where n is the geographic id of a targeted board.

Select mask decoding by the slave is not currently supported by the Alma device, and it will accept all broadcasts, even if it is not selected. One workaround is to setup several separate slave A64 windows targetting the same physical memory, and only enable the appropriate ones for a given select mask.

The almavmechan(1) command has an option –dmabdcst to generate 2ESST broadcasts.

EXAMPLES

Refer also to the example files Dma.c, Dma2.c, GEN_intr.c, RECV_intr.c, MasterSgl.c in /usr/share/vmetoolkit/examples.

RESTRICTIONS

Currently, the driver and ioctls do not provide meaningful errno values on error.

SEE ALSO

almavmechan(1), mbm3k(1)
Alma2f User Manual CI.DT.A00

FILES

/dev/almavme
/dev/vme*X*

7.12.2 almavmechan

NAME

almavmechan – VME bus utility for almavme driver

SYNOPSIS

–vmememalloc *name vmeaddr size flag*
–vmeioalloc *name vmeaddr size flags*
–vmefree *cpu_addr*
–pcialloc *name vmeadr cpuadr size fg*
–pcifree *id*
–printall
–vmeioprint
–vmememprint
–pciprint
–vmeintrgen *level vector*
–vmeintrctrl *mask on/off*
–vmeiointset *vector*
–vmeiointclr *vector*
–vmeintwait *id*
–setamrw *value*
–vmeedit
–getalmastate
–setalmastate *val*
–editalmastate
–dmastart *vmeadr dramadr size fg*
–dmabdcst *vmeadr pwbadr size fg sel*
–dmawait *id*
–physmemalloc *size*
–physmemfree *phys_addr*

DESCRIPTION

almavmechan can create and delete PCI to VME or VME to PCI channels using the ALMA PCI to VME bridge. It prints the current channels opened. It can also read and modify the bridge's state. This utility uses the ioctl's of the VME bus driver described in almavme(4).

OPTIONS

–vmememalloc *name vmeaddr size flag*

allocate a PCIMEM to VME channel

–vmeioalloc *name vmeaddr size flags*

allocate a PCIIO to VME channel

–vmefree *cpu_addr*

free a PCI to VME channel

–pcialloc *name vmeadr cpuadr size fg*

allocate a VME to PCI channel. *fg* parameter defines the VME standard AM as ALMA bridge register format. The following table shows the *fg* values for the different VME standard AM value:

A32 USER MBLT (AM 0x08) fg = 0x00201013
A32 USER DATA (AM 0x09) fg = 0x00202013
A32 USER PROG (AM 0x0A) fg = 0x00204013
A32 USER BLT (AM 0x0B) fg = 0x00208013
A32 SUPER USER MBLT (AM 0x0C) fg = 0x00210013
A32 SUPER USER DATA (AM 0x0D) fg = 0x00220013
A32 SUPER PROG (AM 0x0E) fg = 0x00240013
A32 SUPER BLT (AM 0x0F) fg = 0x00280013
A24 USER MBLT (AM 0x38) fg = 0x08001013
A24 USER DATA (AM 0x39) fg = 0x08002013
A24 USER PROG (AM 0x3A) fg = 0x08004013
A24 USER BLT (AM 0x3B) fg = 0x08008013
A24 SUPER USER MBLT (AM 0x3C) fg = 0x08010013
A24 SUPER USER DATA (AM 0x3D) fg = 0x08020013
A24 SUPER USER PROG (AM 0x3E) fg = 0x08040013
A24 SUPER USER BLT (AM 0x3F) fg = 0x08080013
A16 USER (AM 0x29) fg = 0x02002013
A16 SUPER (AM 0x2D) fg = 0x02020013
A16 LCK (AM 0x2C) fg = 0x02010013

A16 USER, A16 SUPER, A16 LCK can not be used to initialize a VME to PCI memory window due to the current driver window size definition that must be higher or equal to 1MB.
A24 USER MBLT, A24 SUPER USER MBLT are identify as AM that present some transfer error.
For these cases please contact the Kontron support.

–pcifree *id*

free a VME to PCI channel

–printall

print all allocated channels.

–vmeioprint

print all PCIIO to VME channels.

–vmememprint

print all PCIMEM to VME channels.

–pciprint

print all VME to PCI channels.

–vmeintrgen *level vector*

send a VME interrupt.

–vmeintrctrl *mask on/off*

mask or unmask VME interrupts.

–vmeiointset *vector*

connect a VME interrupt.

–vmeiointclr *vector*

disconnect a VME interrupt.

–vmeintwait *id*

wait for a VME interrupt.

–setamrw *value*

set AM (address modifier) to use for accesses through standard read() and write() routines.

–vmeedit

use the VME data editor to do direct VME bus read/writes (with VME addresses).

–getalmastate

print the current Alma state.

–setalmastate *val*

set the Alma state.

–editalmastate

change the Alma state interactively.

–dmastart *vmeadr dramadr size fg*

start a DMA between VME and PCI.

–dmabdcst *vmeadr pwbadr size fg sel*

start a broadcast DMA.

–dmawait *id*

wait for the end of a DMA.

–physmemalloc *size*

allocate a contiguous physical memory area.

–physmemfree *phys_addr*

free a contiguous physical memory area.

EXAMPLES

To create a PCI–MEM to VME channel at VME address 0x10000000, size of 8 MB with read ahead and write posting modes:

```
# almavmechan –vmememalloc GREAT 0x10000000 0x8000000 0x3
  0xd2000000
```

The result 0xd2000000 is the CPU physical address needed to access VME address 0x10000000.

To print all opened channels and the state of the ALMA bridge:

```
# almavmechan –printall


------------------------------------------------------------------------
                     No PCIIO to VME CHANNEL
------------------------------------------------------------------------
```

```
------------------------------------------------------------------------
                     PCIMEM to VME CHANNELS
------------------------------------------------------------------------
  Name       CPUaddr     PCIaddr     VMEaddr  size(Mb)     AM     Conv  WP  RH
------------------------------------------------------------------------
GREAT         0xd2000000 0x52000000 0x10000000  0128     A32SDATA ADDR  Yes
Yes
------------------------------------------------------------------------
------------------------------------------------------------------------
                     No VME to PCI CHANNEL
------------------------------------------------------------------------
Alma state:
        System controller: fixed priority.
                           timeout 100
        Fair mode timeout.
        Not Fair mode.
        VME bus release mode :  ROR
        Request level : BR3
        Dead lock logic ON.
        2ESST rate  FAST
```

SEE ALSO

almavme(4), mbm3k(1)

7.12.3 VME IRQ Response Time Improvement

By default the Linux kernel uses the C-State mode in the IDLE loop.

This feature impacts the performance of waking up a IDLE CPU.

The VME IRQ response time can have some relationship with the IDLE CPU mode in the Linux kernel.

To avoid a lack of VME IRQ response time, the '`idle=poll`' can be given to the linux kernel command line.

7.13 CPLD

NAME

cpld – Kontron board facilities, cpld_i2c, cpld_smi, cpld_leds, cpld-gpio, cpld-wdt

DESCRIPTION

This man page describes some of the facilities made available by the cPLD (complex programmable logic device) on several Kontron boards. Not all boards provide all the facilities.

The cPLD is a small device that controls some low – level aspects of the board, including power up sequencing, reset, gpios, i2c buses including one for communication to the backplane, timer, watchdog, leds, and many configuration and control features.

The device is visible through 1 – byte registers in i/o port space from addresses 0x0800 to 0x08FF. The facilities are implemented in several drivers, each in its own rpm. The driver sources are provided.

cpld
The cpld driver is needed by the other drivers. It provides the geographical id (slot number) of the board in the file /**proc**/**geo_id**.

Some other basic features can be accessed with the cpldtool(1) utility, or by direct i/o on the appropriate port. For example, use dd on /**dev**/**port** or the **port** command (from rpm **hwtools**) as user root (beware: inappropriate i/o on ports may crash the system). As an example port 0x800 holds the version number of the cpld:

```
[root@ki7]# port 0x800
@0x800 = 0x06
```

Reset cpuB

On boards with two separate cpus, you can reset cpuB from cpuA or vice versa by setting lsb bit 0 to 0 in port 0x804. This is most easily done with the cpldtool utility:

```
[root@ki7]# cpldtool -f PWR_RST_CONFIG Software_Cross_Reset 0
```

The alternative is to read the port to find the current value, calculate the new value obtained by clearing bit 0 (which should always read as 1), and write the new value back. The bit will return to 1 on its own.

Access cpuB Serial Port

On boards with two separate cpus, you can enable access to cpuB's second console serial port from cpuA by dynamically setting the appropriate bit in cpld register 0xc, or permanently by configuring the bios. The two /dev/ttyS1 devices on the board are then linked together and can communicate via some utility like minicom or pyserial's miniterm.py:

```
[root@ki7]# cpldtool -f BOARD_CONFIGURATION SERIAL2_cfg 1
[root@ki7]# miniterm.py /dev/ttyS1 115200
```

To configure this permanently with the bios on cpuA follow the menus:

```
Kontron
Serial Configuration
COM1 Link Mode: [Enabled]
```

To see the cpuB bios on ttyS1, configure the cpuB bios with:

```
Advanced
Serial Port Console Redirection
```

```
COM1
Console Redirection [Enabled]
```

To have Linux use the ttyS1 console ensure it has the boot option:

```
console=ttyS1,115200
```

cpld_i2c
The cpld_i2c driver implements an i2c algorithm made available through the standard OS i2c interface.

cpld_smi
The cpld_smi driver provides a file and utility to program the onboard ethernet switch over the smi (Serial Management Interface) bus. The device /**dev**/**cpld_smi** has 2 ioctls to read and write a given register in the switch, snd the **swsmi** utility uses this device.

cpld_leds
The cpld_leds driver provides standard OS led class devices in /**sys**/**class**/**leds**/. They have filenames of the form *devicename:colour*.

Each cpu has 2 user settable leds, with devices named **led2** and **led3**. On the VM6050, each cpu also has 2 additional user settable leds, named **led4** and **led5**.

They implement 3 brightness levels by writing a value to *devicename:colour*/brightness

- 0 on
- 1 slow blink
- 2 fast blink

This switches each LED to user mode. Write 0 to *devicename*:OFF/brightness to switch an LED off, or any other value to exit from user mode. See the discussion in file **.../Documentation/leds – class.txt** (from rpm **kernel – doc**).

cpld – gpio
See the separate man page for the driver providing gpios implemented by the cpld.

cpld – wdt
See the separate man page for the driver providing a watchdog implemented by the cpld.

SEE ALSO
cpld – gpio(4)
cpld – wdt(4)
cpldtool(1)

FILES
/proc/geo_id
/dev/cpld_smi
/dev/port
/dev/i2c – 0 ...

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Chapter 8 - RC Boards

8.1 How to Manage the Lack of RTC Battery

Some hardware constraints may prevent the use of the RTC's battery on the boards. This implies to workaround or disable some standard behaviour of Fedora services. The very first one is "`fsck`" which is run at boot time. `fsck` checks that the date of the last mount of the checked partition is prior to the current date. If not, the boot is stopped in a maintenance mode. This could happen after with the power off and without the RTC's battery. To workaround this, simply create a file named `/etc/e2fsck.conf` with the following content:

```
[options]
broken_system_clock=true
```

The same file has to be added to the `initramfs` too. To do this, simply run the command:

```
[root@ki7]# dracut --force -I /etc/e2fsck.conf
```

Without the right date for the system, some other services and functions may present problems. For example, the command "`make`" warns if there is some previous build detected in the future and this could lead to bad recompilation. If the network is available, it is recommended to setup the service `ntpd` to adjust the system date with a date server.

8.2 External Devices Connection

One impact of the RC board is the missing of front panel.

As a consequence, devices requiring access to the system such as:

- Serial line console.
- USB mouse
- USB keyboard
- Display monitor (through the mini DP or VGA)
- Ethernet

will be plugged in from the rear side through a Rear Transition Module (RTM) Paddle board.

The Kontron PB-VX3-4xx is a 3U VPX Rear Transition Module compliant with the definition of the Rear Transition Module on VPX Standard –VITA 46.10.

It provides rear I/O peripherals connectivity for Kontron VX30xx Single Board Computers.

The Kontron VM6050-RTM (Order Code: PBV36-P0-VM6-00) rear transition module is compliant to PMC I/O Module Standard VITA 36 - 199x Draft 0.1 July 19, 1999 (mechanical and PIM format) and is available for VM6050 boards.

For example, in order to perform a graphical linux installation stage on a VX3040-RC, plug in the required devices to the paddle board:

- USB mouse and USB keyboard through a USB HUB.
- The display monitor (through the mini DP).

After turning on the system, you should notice all devices have been recognized correctly allowing to take control of the graphical environment.

8.3 RC Specifications

The RC version of the boards is designed to work in different environmental constraints and for different levels of temperature and power dissipation.

This may imply specific setups (cpu frequencies, hardware parameters,…) to guarantee the specified behavior.

They are described in the “Hardware User’s Guide” of each board. Please check this document for your board and for the required environment.

Chapter 9 - Power Management

9.1 Introduction

At the core of power management is an understanding of how to effectively optimize energy consumption of each system component.

By studying the different tasks that your system performs, and configuring each component to ensure that its performance is just sufficient for the job, you can save energy, generate less heat.

Many of the principles for analysis and tuning of a system in regard to power consumption are similar to those for performance tuning.

To some degree, power management and performance tuning are opposite approaches to system configuration, because systems are usually optimized either towards performance or power.

Two types of tools are available:

- The ones to set-up the power management configuration:
  - BIOS menu and `cpufreq` (under linux).
- The ones to evaluate the impact of this setting on the system:
  - `powertop` under linux.

9.2 Power Management Setting

9.2.1 Under BIOS

A way to reduce the power consumption (the drawback being the decreasing of performance) is to disable the **Hyper-Threading** mode as well as the **Turbo-Mode**.

To disable the **Hyper-Threading**:

- Enter the bios and select the submenu **Advanced -> CPU Configuration**
- Then set the option **hyper threading** to **Disabled**.

To disable the Turbo Mode

- Enter bios and select the submenu **Advanced -> CPU PPM Configuration**
- Then set the option **Turbo mode** to **Disabled**.

An alternative is to use the BIOS TDP menu:

- This option is specific to the VX3044 board.

The thermal design power (TDP), sometimes called thermal design point, refers to the maximum amount of power the cooling system in a computer is required to dissipate.

The move to a 22nm process and Tri-Gate transistors alone should already account for some pretty significant power savings. But there are a few other changes in Ivy Bridge meant to optimize power consumption.

An important addition brought to mobile Ivy Bridge processors is the inclusion of a configurable TDP that allows them to switch between three different ratings:

nominal, a lower configurable TDP and an upper configurable TDP.

The lower configurable TDP implies the lowest power comsumption of course.The BIOS TDP menu is accessible under `enhanced/CPU Configuration/CPU PPM` Configuration.

9.2.2 Under Linux

The main power management tool available under linux is CPUFreq.

CPUfreq allows the clock speed of the processor to be adjusted on the fly.

This enables the system to run at a reduced clock speed to save power.

Different types of CPUfreq governors are available:

```
cpufreq_performance
```

The performance governor forces the CPU to use the highest possible clock frequency (no power saving benefit at all).

```
cpufreq_powersave
```

By contrast, the Powersave governor forces the CPU to use the lowest possible clock frequency.

```
cpufreq_ondemand
```

The ondemand governor is a dynamic governor that allows the CPU to achieve maximum clock frequency when system load is high and also minimum clock frequency when system is idle.

This is the default mode (best compromise between heat emission,power consumption,performance and manageability).

```
cpufreq_userspace
```

Allows userspace program to set the frequency. Used normally in conjunction with the cpuspeed daemon.

```
cpufreq_conservative
```

Similar to the cpufreq_ondemand mode but this mode switches between frequencies more gradually. Boot the target under linux and log as root.

At first, you can view which governor the system is currently using with the command:

```
[root@ki7]#cat /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor
```

The result will be probably:

ondemand because this is the default value.

You can also view which governors are available for the CPUs:

```
[root@ki7]#cat
/sys/devices/system/cpu/cpu0/cpufreq/scaling_available_governors
```

At this step, select the governor mode which fits the best your need with the command:

```
[root@ki7]#echo xxxx     > /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor
```

Control the result by:

```
[root@ki7]#cat /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor
```

An alternative consists of selecting an explicit frequency by using a command such as:

```
[root@ki7]# cd /sys/devices/system/cpu
[root@ki7]# for i in 0 1 2 3
do ; cd cpu$i ; echo 1300000 > cpufreq/scaling_max_freq; cd ..; done
```

This sets frequency 1.3 GHZ for all the CPUs. If you want to know the set of available frequencies:

```
[root@ki7]# cd /sys/devices/system/cpu
[root@ki7]# for i in 0 1 2 3
do ; cd cpu$i ; cat cpufreq/scaling_available_frequencies; cd ..; done
```

9.3 Impact of the Power Management Policy

Boot linux and login as root. The powertop tool identifies specific components of kernel and user-space applications that frequently wake up the CPU. Install the `powertop` package with the command:

```
[root@ki7]# yum install powertop
```

Next run `powertop` with the command

```
[root@ki7]# powertop
```

while it runs, `powertop` gathers statistics from the system.

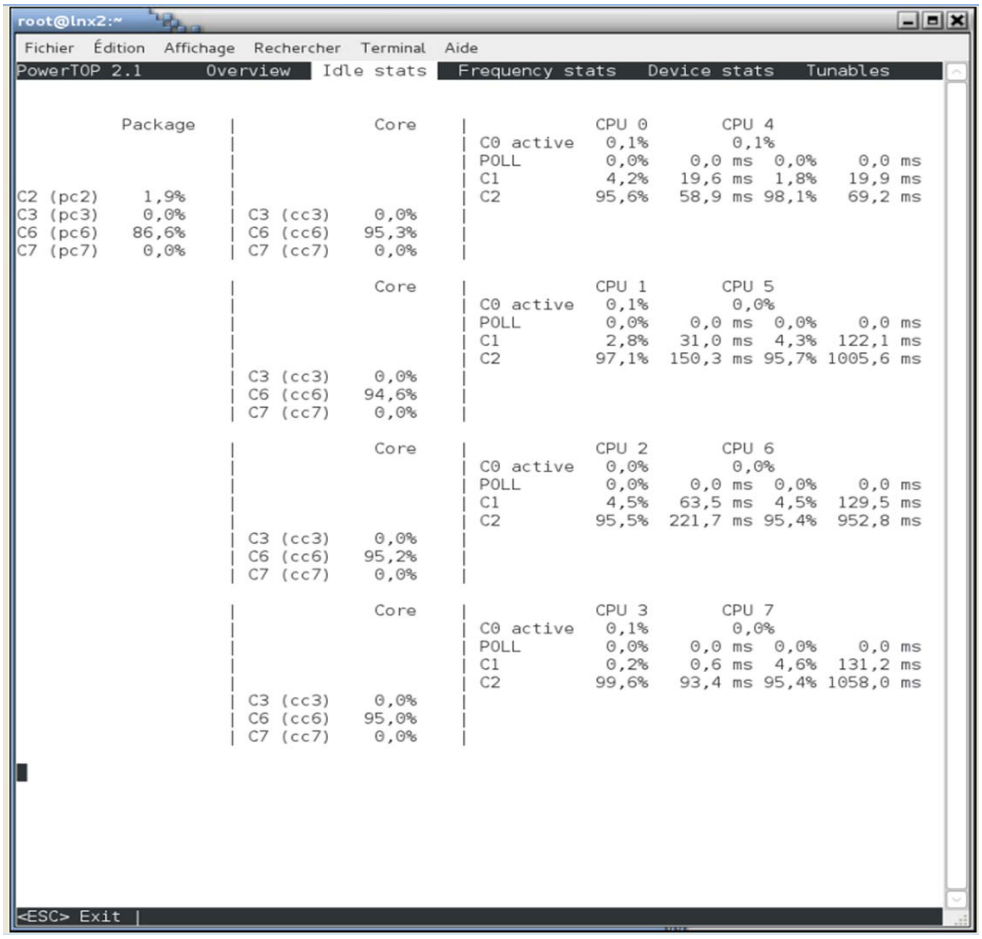
9.3.1 Hyper-Threading + Turbo Mode Enabled

The purpose of this configuration is to obtain as much performance as possible. This is the default configuration (Except on Kontron RC -Rugged Conduction-Cooled- board which implies disabling the turbo mode in order to fit the maximal temperature constraint).

Run PowerTop with the command:

```
[root@ki7]# powertop
```

And move to the `Idle Stats` option.


root@lnx2:~
Fichier Édition Affichage Rechercher Terminal Aide
PowerTOP 2.1 Overview Idle stats Frequency stats Device stats Tunables
Package
C2 (pc2) 1,9%
C3 (pc3) 0,0%
C6 (pc6) 86,6%
C7 (pc7) 0,0%
Core
C3 (cc3) 0,0%
C6 (cc6) 95,3%
C7 (cc7) 0,0%
CPU 0 CPU 4
C0 active 0,1% 0,1%
POLL 0,0% 0,0 ms 0,0% 0,0 ms
C1 4,2% 19,6 ms 1,8% 19,9 ms
C2 95,6% 58,9 ms 98,1% 69,2 ms
Core
C3 (cc3) 0,0%
C6 (cc6) 94,6%
C7 (cc7) 0,0%
CPU 1 CPU 5
C0 active 0,1% 0,0%
POLL 0,0% 0,0 ms 0,0% 0,0 ms
C1 2,8% 31,0 ms 4,3% 122,1 ms
C2 97,1% 150,3 ms 95,7% 1005,6 ms
Core
C3 (cc3) 0,0%
C6 (cc6) 95,2%
C7 (cc7) 0,0%
CPU 2 CPU 6
C0 active 0,0% 0,0%
POLL 0,0% 0,0 ms 0,0% 0,0 ms
C1 4,5% 63,5 ms 4,5% 129,5 ms
C2 95,5% 221,7 ms 95,4% 952,8 ms
Core
C3 (cc3) 0,0%
C6 (cc6) 95,0%
C7 (cc7) 0,0%
CPU 3 CPU 7
C0 active 0,1% 0,0%
POLL 0,0% 0,0 ms 0,0% 0,0 ms
C1 0,2% 0,6 ms 4,6% 131,2 ms
C2 99,6% 93,4 ms 95,4% 1058,0 ms
<ESC> Exit

The different C-states of the CPU are defined as follows:

- C0: Running state: the CPU is working with no `idle` at all.
- C1, Halt: a state where the processor is not executing any instruction but is typically not in a lower power state.
- C2 Stop clock: a state where the clock is frozen for the processor but it keeps the complete state for its registers and caches.
- C3 sleep: a state where the processor really goes to sleep.
- C6: (specific to Nehalem architecture) the power supply of the CPU can be reduced to 0.

Then, run the following process in order to load the CPUs:

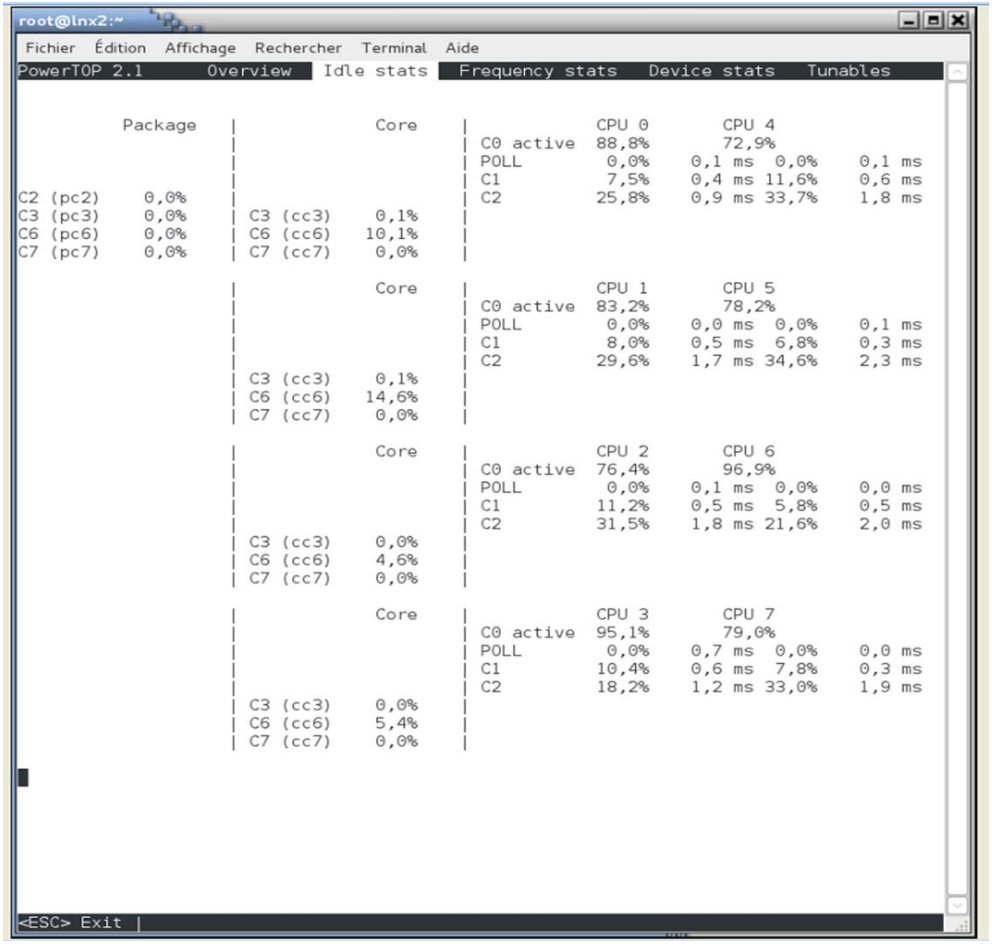
```
[root@ki7]# while true; do rm -rf squashfs-root ; unsquashfs squashfs.img; done &
```

Analyse the impact on the `Idle Stats`:

`Run Powertop` with the command:

```
[root@ki7]# powertop
```

And move to the `Idle Stats` option.

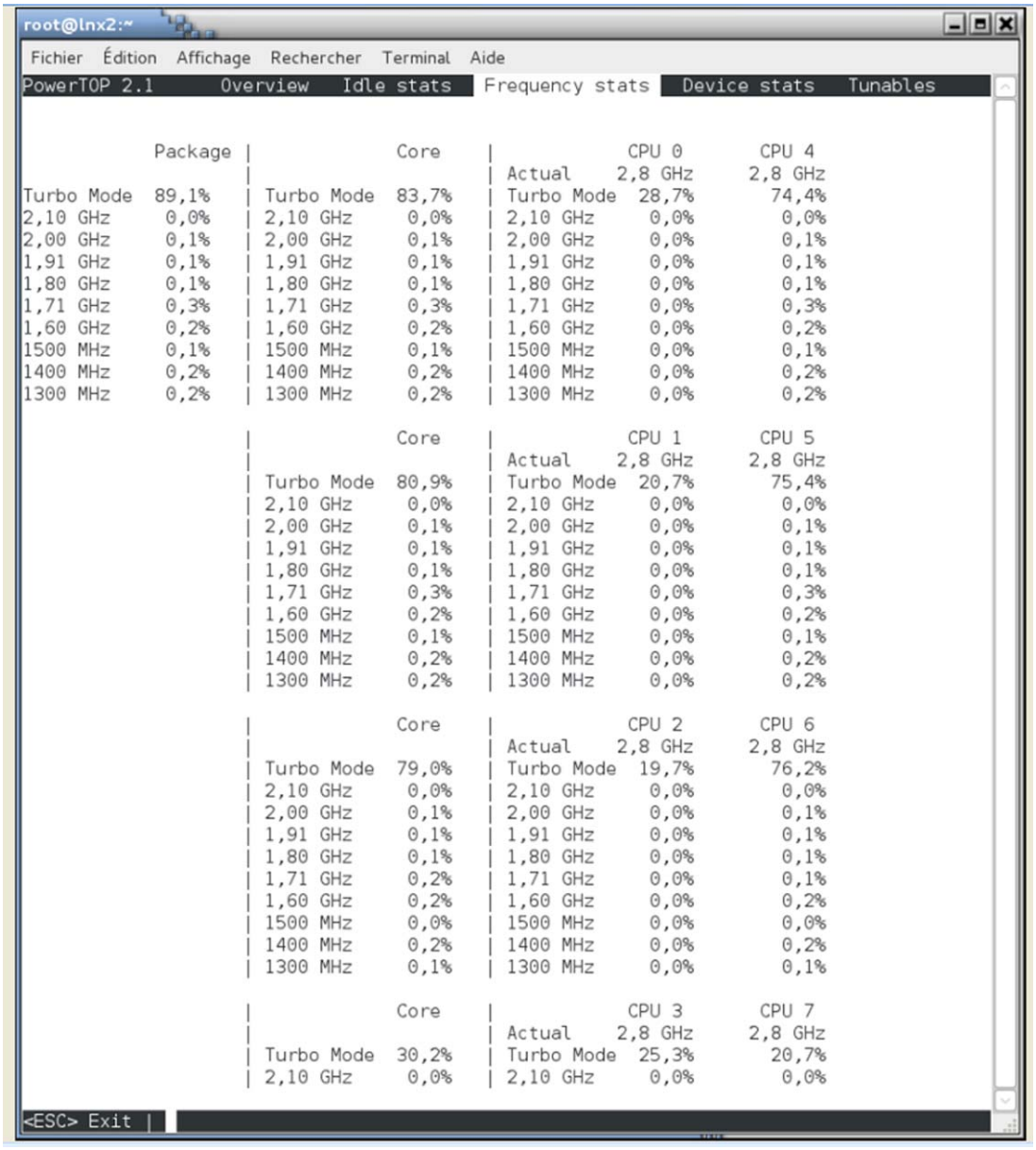

root@lnx2:~
Fichier Édition Affichage Rechercher Terminal Aide
PowerTOP 2.1 Overview Idle stats Frequency stats Device stats Tunables
Package
Core
CPU 0 CPU 4
C0 active 88,8% 72,9%
POLL 0,0% 0,1 ms 0,0% 0,1 ms
C1 7,5% 0,4 ms 11,6% 0,6 ms
C2 25,8% 0,9 ms 33,7% 1,8 ms
C2 (pc2) 0,0%
C3 (pc3) 0,0%
C6 (pc6) 0,0%
C7 (pc7) 0,0%
C3 (cc3) 0,1%
C6 (cc6) 10,1%
C7 (cc7) 0,0%
Core
CPU 1 CPU 5
C0 active 83,2% 78,2%
POLL 0,0% 0,0 ms 0,0% 0,1 ms
C1 8,0% 0,5 ms 6,8% 0,3 ms
C2 29,6% 1,7 ms 34,6% 2,3 ms
C3 (cc3) 0,1%
C6 (cc6) 14,6%
C7 (cc7) 0,0%
Core
CPU 2 CPU 6
C0 active 76,4% 96,9%
POLL 0,0% 0,1 ms 0,0% 0,0 ms
C1 11,2% 0,5 ms 5,8% 0,5 ms
C2 31,5% 1,8 ms 21,6% 2,0 ms
C3 (cc3) 0,0%
C6 (cc6) 4,6%
C7 (cc7) 0,0%
Core
CPU 3 CPU 7
C0 active 95,1% 79,0%
POLL 0,0% 0,7 ms 0,0% 0,0 ms
C1 10,4% 0,6 ms 7,8% 0,3 ms
C2 18,2% 1,2 ms 33,0% 1,9 ms
C3 (cc3) 0,0%
C6 (cc6) 5,4%
C7 (cc7) 0,0%
<ESC> Exit

Notice the CPU passed most of the time in the C0 state revealing the CPU is very busy.

Analyse the frequencies of the different CPUs with the command:

```
[root@ki7]# powertop
```

And move to the `Frequency Stats` option.


root@lnx2:~
Fichier Édition Affichage Rechercher Terminal Aide
PowerTOP 2.1 Overview Idle stats Frequency stats Device stats Tunables
Package | Core | CPU 0 CPU 4
| Actual 2,8 GHz 2,8 GHz
Turbo Mode 89,1% | Turbo Mode 83,7% | Turbo Mode 28,7% 74,4%
2,10 GHz 0,0% | 2,10 GHz 0,0% | 2,10 GHz 0,0% 0,0%
2,00 GHz 0,1% | 2,00 GHz 0,1% | 2,00 GHz 0,0% 0,1%
1,91 GHz 0,1% | 1,91 GHz 0,1% | 1,91 GHz 0,0% 0,1%
1,80 GHz 0,1% | 1,80 GHz 0,1% | 1,80 GHz 0,0% 0,1%
1,71 GHz 0,3% | 1,71 GHz 0,3% | 1,71 GHz 0,0% 0,3%
1,60 GHz 0,2% | 1,60 GHz 0,2% | 1,60 GHz 0,0% 0,2%
1500 MHz 0,1% | 1500 MHz 0,1% | 1500 MHz 0,0% 0,1%
1400 MHz 0,2% | 1400 MHz 0,2% | 1400 MHz 0,0% 0,2%
1300 MHz 0,2% | 1300 MHz 0,2% | 1300 MHz 0,0% 0,2%
| Core | CPU 1 CPU 5
| Actual 2,8 GHz 2,8 GHz
| Turbo Mode 80,9% | Turbo Mode 20,7% 75,4%
| 2,10 GHz 0,0% | 2,10 GHz 0,0% 0,0%
| 2,00 GHz 0,1% | 2,00 GHz 0,0% 0,1%
| 1,91 GHz 0,1% | 1,91 GHz 0,0% 0,1%
| 1,80 GHz 0,1% | 1,80 GHz 0,0% 0,1%
| 1,71 GHz 0,3% | 1,71 GHz 0,0% 0,3%
| 1,60 GHz 0,2% | 1,60 GHz 0,0% 0,2%
| 1500 MHz 0,1% | 1500 MHz 0,0% 0,1%
| 1400 MHz 0,2% | 1400 MHz 0,0% 0,2%
| 1300 MHz 0,2% | 1300 MHz 0,0% 0,2%
| Core | CPU 2 CPU 6
| Actual 2,8 GHz 2,8 GHz
| Turbo Mode 79,0% | Turbo Mode 19,7% 76,2%
| 2,10 GHz 0,0% | 2,10 GHz 0,0% 0,0%
| 2,00 GHz 0,1% | 2,00 GHz 0,0% 0,1%
| 1,91 GHz 0,1% | 1,91 GHz 0,0% 0,1%
| 1,80 GHz 0,1% | 1,80 GHz 0,0% 0,1%
| 1,71 GHz 0,2% | 1,71 GHz 0,0% 0,1%
| 1,60 GHz 0,2% | 1,60 GHz 0,0% 0,2%
| 1500 MHz 0,0% | 1500 MHz 0,0% 0,0%
| 1400 MHz 0,2% | 1400 MHz 0,0% 0,2%
| 1300 MHz 0,1% | 1300 MHz 0,0% 0,1%
| Core | CPU 3 CPU 7
| Actual 2,8 GHz 2,8 GHz
| Turbo Mode 30,2% | Turbo Mode 25,3% 20,7%
| 2,10 GHz 0,0% | 2,10 GHz 0,0% 0,0%
<ESC> Exit |

LOG related to the `powertop Freq Stats` in turbo mode with load

Notice the frequencies remain at the top level around 2.8 GHZ.

9.3.2 Turbo mode disabled + CpuFreq policy=Powersave

Select the `CpuFreq powersave` mode by running:

```
[root@ki7]# cd /sys/devices/system/cpu
[root@ki7]# for i in 0 1 2 3 4 5 6 7
do ; cd cpu$i ; echo powersave > cpufreq/scaling_governor; cd ..; done
```

Then run this process in order to load the CPU:

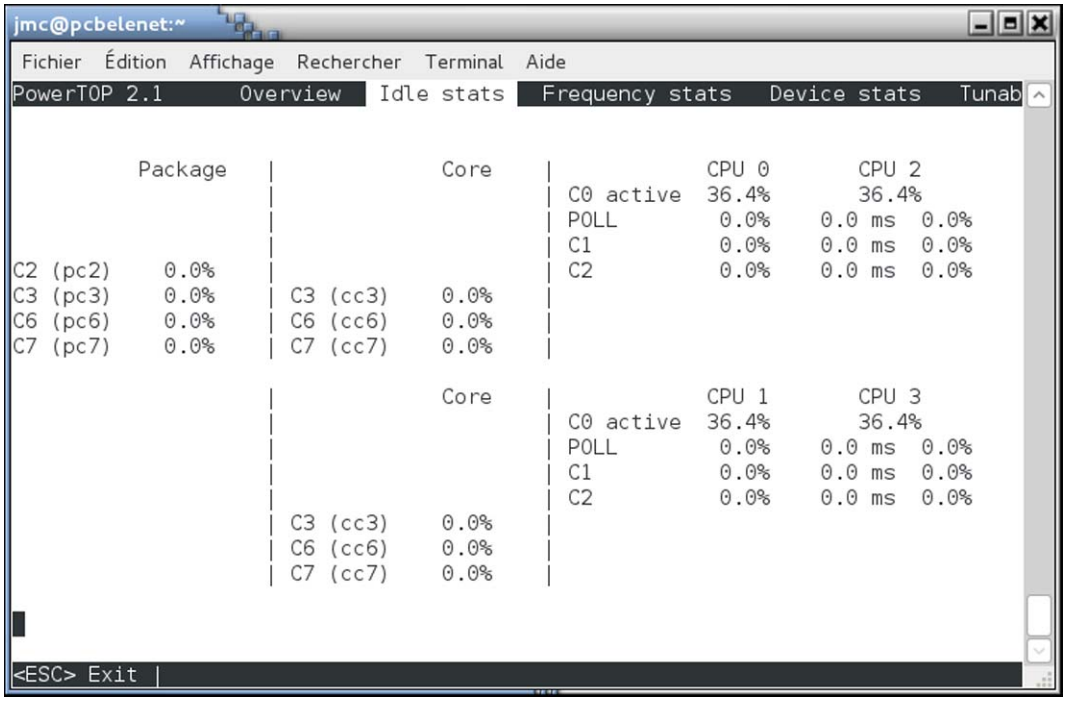
```
[root@ki7]# while true; do rm -rf squashfs-root ; unsquashfs squashfs.img; done &
```

Notice the impact using the `powertop` tool.

```
[root@ki7]# powertop
```

And move to the `Idle Stats` option.

The result should look like:


jmc@pcbelenet:~
Fichier Édition Affichage Rechercher Terminal Aide
PowerTOP 2.1 Overview Idle stats Frequency stats Device stats Tunab
Package | Core | CPU 0 CPU 2
| C0 active 36.4% 36.4%
| POLL 0.0% 0.0 ms 0.0%
| C1 0.0% 0.0 ms 0.0%
C2 (pc2) 0.0% | C2 0.0% 0.0 ms 0.0%
C3 (pc3) 0.0% | C3 (cc3) 0.0%
C6 (pc6) 0.0% | C6 (cc6) 0.0%
C7 (pc7) 0.0% | C7 (cc7) 0.0%
| Core | CPU 1 CPU 3
| C0 active 36.4% 36.4%
| POLL 0.0% 0.0 ms 0.0%
| C1 0.0% 0.0 ms 0.0%
| C2 0.0% 0.0 ms 0.0%
| C3 (cc3) 0.0%
| C6 (cc6) 0.0%
| C7 (cc7) 0.0%
<ESC> Exit |

Then move to the `Frequency Stats` option.

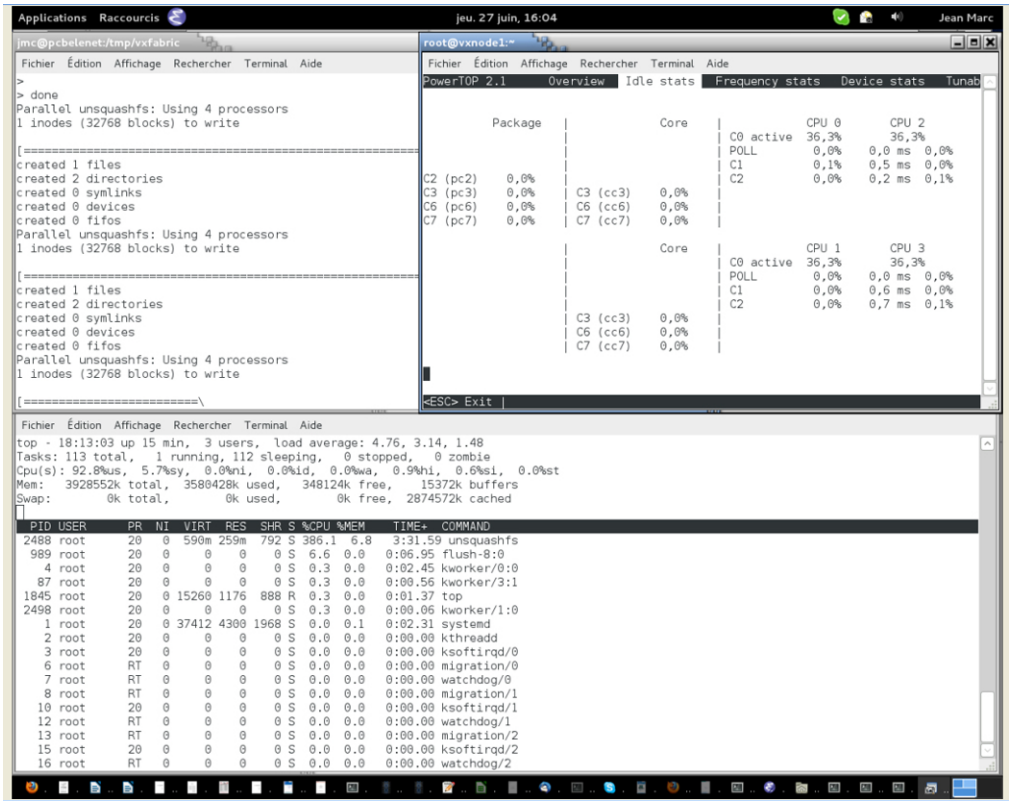
9.3.3 TDP LOW mode (low power comsumption oriented)

Select the appropriate option in the BIOS TDP menu.

Then run this loop in order to load the system as much as possible:

```
[root@ki7]# while true; do rm -rf squashfs-root ; unsquashfs squashfs.img; done &
```

And analyse the result with **powertop**


Applications Raccourcis
jeu. 27 juin, 16:04
Jean Marc
PowerTOP 2.1 Overview Idle stats Frequency stats Device stats Tunab
Package
Core
CPU 0
CPU 2
CPU 1
CPU 3
C0 active 36,3%
POLL 0,0% 0,0 ms 0,0%
C1 0,1% 0,5 ms 0,0%
C2 0,0% 0,2 ms 0,1%
C3 (cc3) 0,0%
C6 (cc6) 0,0%
C7 (cc7) 0,0%
<ESC> Exit
top - 18:13:03 up 15 min, 3 users, load average: 4.76, 3.14, 1.48
Tasks: 113 total, 1 running, 112 sleeping, 0 stopped, 0 zombie
Cpu(s): 92.8%us, 5.7%sy, 0.0%ni, 0.0%id, 0.0%wa, 0.9%hi, 0.6%si, 0.0%st
Mem: 3928552k total, 3580428k used, 348124k free, 15372k buffers
Swap: 0k total, 0k used, 0k free, 2874572k cached
PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
2488 root 20 0 590m 259m 792 S 386.1 6.8 3:31.59 unsquashfs
989 root 20 0 0 0 0 S 6.6 0.0 0:06.95 flush-8:0
4 root 20 0 0 0 0 S 0.3 0.0 0:02.45 kworker/0:0
87 root 20 0 0 0 0 S 0.3 0.0 0:00.56 kworker/3:1
1845 root 20 0 15260 1176 888 R 0.3 0.0 0:01.37 top
2498 root 20 0 0 0 0 S 0.3 0.0 0:00.06 kworker/1:0
1 root 20 0 37412 4300 1968 S 0.0 0.1 0:02.31 systemd
2 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kthreadd
3 root 20 0 0 0 0 S 0.0 0.0 0:00.00 ksoftirqd/0
6 root RT 0 0 0 0 S 0.0 0.0 0:00.00 migration/0
7 root RT 0 0 0 0 S 0.0 0.0 0:00.00 watchdog/0
8 root RT 0 0 0 0 S 0.0 0.0 0:00.00 migration/1
10 root 20 0 0 0 0 S 0.0 0.0 0:00.00 ksoftirqd/1
12 root RT 0 0 0 0 S 0.0 0.0 0:00.00 watchdog/1
13 root RT 0 0 0 0 S 0.0 0.0 0:00.00 migration/2
15 root 20 0 0 0 0 S 0.0 0.0 0:00.00 ksoftirqd/2
16 root RT 0 0 0 0 S 0.0 0.0 0:00.00 watchdog/2

The CPU is used only at 36 % of its capacity.

Chapter 10 - Create a USB Flash Disk from DVD Iso Image

Kontron can provide DVD-ROM media or ISO disk images.

This chapter provides information for customer to be able to generate a USB flash disk from the iso image.

This USB flash disk build allows to emulate a USB DVD-ROM from BIOS boot.

What do you need:

1. Host machine with at least Fedora 16.
2. A USB Flash Disk.
3. Kontron Fedora 16 BSP iso image.

Please Verify that the package '`livecd-tools`' is installed.

Then type the following command with the root privilege:

```
livecd-iso-to-disk --format --msdos --reset-mbr
/root/BuildDVD/16/Fedora/x86_64/iso/Fedora-16_ki7-x86_64-DVD.iso /dev/sdb
```

Where:

- `Fedora-16_ki7-x86_64-DVD.iso` is the Kontron BSP iso image
- `/dev/sdb`: USB Flash disk connected for example on RTM or front panel.
- `livecd-iso-to-disk`: Command available in the package '`livecd-tools`'

Chapter 11 - Additional Information

11.1 Known Limitations

SUSPEND Mode not supported

The SUSPEND mode is not supported by the current graphic chipset hardware.

So, follow this procedure in order to disable it:

- Create a new configuration file under `/etc/polkit-1/localauthority`

```
# vi /etc/polkit-1/localauthority/50-local.d/50-disable-suspend.pkla
```

- Copy the following code into that file:

```
[Disable Suspend]
Identity=unix-user:*
Action=org.freedesktop.upower.hibernate;org.freedesktop.upower.suspend
ResultAny=no
ResultInactive=no
ResultActive=no
```

- Finally check that the permission was successfully revoked

```
$ pkcheck --action-id org.freedesktop.upower.suspend --process $$

Not authorized.
```

If you get no output from the `pkcheck` command (make sure to run it as a normal user, not root) the permission is still there.

That is it, after re-login the annoying Suspend will be replaced by a friendly Power Off.

SATA interface on VM6052/VM6054

For the PCB level A, the SATA interface speed must be limited to 1.5 Gbps.

The file `/etc/grub.d/80_ki7` must have the following line modified as shown below:

```
APPEND_LINUX="pcie_aspm=off console=ttyS0,115200 vmalloc=512MB selinux=0
acpi_enforce_resources=lax libata.force=1.5G"
```

Follow the instruction in section 6.4 “SATA Speed” page 21.

Boot time in graphic mode higher than 30s

With full graphic Fedora 16 packages installed on SATA disk, the boot time from an exit in the EFI shell to the GDM graphical login window can be higher that 30 seconds.

For more details contact the Kontron support team.

11.2 BSP Installation on Ki7 Boards for BSP ID < 14085

During the installation the Kontron Fedora 16 BSP DVD provides and installs all necessary standard and Kontron BSP packages automatically.
After the installation manpages, specific Kontron drivers and tools are already installed.
In this section, the following explanations are not needed for release BSP ID < 14085.

The BSP packages are present on the media: **Fedora 16 x86_64 DVD for Ki7 boards.**

Follow the procedure below to install the BSP onto an existing bootable media (SATA disk or USB flash) or to access to the source packages:

1. Insert the Kontron media Fedora 16 x86_64 DVD for Ki7 boards in the USB DVD-ROM drive.
2. Boot the Ki7 board on the SATA disk previously installed with the Fedora 16.
3. Login as root and run the following commands:
   - At first, create a repo file in order to acces the packages present on the DVD.

```
# mount /dev/sr0 /mnt
# cat >/etc/yum.repos.d/ki7_bsp.repo <<EOF
[ki7_bsp]
name=ki7_bsp
gpgcheck=0
enabled=0
baseurl=file:///mnt/
EOF
```

   - Then install the BSP with the command:

```
 # yum -y --disablerepo=* --enablerepo=ki7_bsp install ki7_bsp
```

   The installation process will take a few minutes.
4. Reboot the machine to take into account the new version of the BSP.

When the BSP is installed, the kernel is updated.

At this step you should configure the system to use the network service instead of the NetworkManager, and also do some other settings to configure the network interfaces to meet the requirements of an embedded system. See important information about that at section "6.1 - Network page 18"

11.3 Rebuild BSP Packages

11.3.1 Introduction

The source code of the BSP packages is provided with the DVD (Fedora 16 x86_64 DVD for Ki7 boards) in the `SRPMS/` directory.

Those source codes are in source rpm format. The following chapter describes the steps to rebuild the binary packages using the rpmbuild command.

Table of the source packages:

`cpld-1.2-15111.src.rpm`	cPLD man pages
`cpld_smi-1.3-15111.src.rpm`	only for VX6080
`cpldtool-1.5-15111.src.rpm`	cPLD tools
`e1000e-2.3.2-15111.src.rpm`	e1000e driver from Intel
`flashrom-0.9.9-15111.src.rpm`	read/write/verify SPI flash (BIOS update)
`fmram-1.1-15111.src.rpm`	sample code to access FRAM
`hwtools-1.3.7-15111.src.rpm`	some tools
`ixgbe-3.18.7-1.src.rpm`	driver for the 10G Ethernet from Intel
`kernel-3.4.9-15111.ki7.fc16.src.rpm`	update of the standard Fedora kernel with Kontron BSP drivers
`ki7_bsp-3.4-15111.fc16.src.rpm`	BSP rpm requiring other rpms as dependencies
`sysvartool-1.7-15111.src.rpm`	utility to get the PBIT report
`turbostat-1.0-1.fc16.src.rpm`	turbostat delivery (update for Ivy Bridge)
`vmetoolkit-1.6-15111.src.rpm`	VME utilities and samples
`vpdtool-1.11-15111.src.rpm`	vpdtool

11.3.2 Example of Building a rpm from the Source rpm

Installation of the source rpm:

```
# rpm -ivh fmram-1.1-15111.src.rpm
```

Source and build environment should be at `~/rpmbuild`.

To full rebuild the rpm, use the `-ba` option of the `rpmbuild` command:

```
# cd ~/rpmbuild/SPECS
# rpmbuild -ba fmram.spec
Executing(%prep): /bin/sh -e /var/tmp/rpm-tmp.5wML8P
+ umask 022
+ cd /root/rpmbuild/BUILD
+ '[' /root/rpmbuild/BUILDROOT/fmram-1.1-15161.x86_64 ']'
+ '[' /root/rpmbuild/BUILDROOT/fmram-1.1-15161.x86_64 '!=' / ']'
+ rm -rf /root/rpmbuild/BUILDROOT/fmram-1.1-15161.x86_64
+ cd /root/rpmbuild/BUILD
+ rm -rf fmram-1.1
+ /usr/bin/gzip -dc /root/rpmbuild/SOURCES/fmram-1.1.tar.gz
```

```
+ /bin/tar -xvvf -
drwxr-xr-x root/root         0 2015-04-21 12:31 fmram-1.1/
-rw-r--r-- root/root      1173 2010-10-15 11:55 fmram-1.1/Makefile
-rw-r--r-- root/root     10795 2010-09-24 15:41 fmram-1.1/i2c-dev.h
-rw-r--r-- root/root       929 2014-10-02 16:42 fmram-1.1/fmram.spec
-rw-r--r-- root/root       345 2010-09-24 15:41 fmram-1.1/rpmmacros
-rw-r--r-- root/root      1434 2010-09-24 15:41 fmram-1.1/i2c_access.h
-rw-r--r-- root/root      3920 2010-09-24 15:41 fmram-1.1/i2c_access.c
-rw-r--r-- root/root       315 2010-09-24 15:41 fmram-1.1/rpmrc
-rw-r--r-- root/root      8407 2015-02-27 13:41 fmram-1.1/fmram.c
+ STATUS=0
+ '[' 0 -ne 0 ']'
+ cd fmram-1.1
+ /bin/chmod -Rf a+rX,u+w,g-w,o-w .
+ exit 0
Executing(%build): /bin/sh -e /var/tmp/rpm-tmp.BPUlW5
+ umask 022
+ cd /root/rpmbuild/BUILD
+ cd fmram-1.1
+ make fmram
cc -g -Wall -o fmram fmram.c i2c_access.c
+ exit 0
Executing(%install): /bin/sh -e /var/tmp/rpm-tmp.puQn6l
+ umask 022
+ cd /root/rpmbuild/BUILD
+ cd fmram-1.1
+ make DESTDIR=/root/rpmbuild/BUILDROOT/fmram-1.1-15161.x86_64 install
install -d /root/rpmbuild/BUILDROOT/fmram-1.1-15161.x86_64/usr/bin
install -m755 fmram /root/rpmbuild/BUILDROOT/fmram-1.1-15161.x86_64/usr/bin/fmram
+ /usr/lib/rpm/brp-compress
+ /usr/lib/rpm/brp-strip /usr/bin/strip
+ /usr/lib/rpm/brp-strip-static-archive /usr/bin/strip
+ /usr/lib/rpm/brp-strip-comment-note /usr/bin/strip /usr/bin/objdump
Processing files: fmram-1.1-15161.x86_64
Requires(rpmlib): rpmlib(CompressedFileNames) <= 3.0.4-1 rpmlib(PayloadFilesHavePrefix) <= 4.0-1
Requires: libc.so.6()(64bit) libc.so.6(GLIBC_2.2.5)(64bit) rtld(GNU_HASH)
Checking   for   unpackaged   file(s):   /usr/lib/rpm/check-files   /root/rpmbuild/BUILDROOT/
fmram-1.1-15161.x86_64
Wrote: /root/rpmbuild/SRPMS/fmram-1.1-15161.src.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/fmram-1.1-15161.x86_64.rpm
Executing(%clean): /bin/sh -e /var/tmp/rpm-tmp.hegU28
+ umask 022
+ cd /root/rpmbuild/BUILD
+ cd fmram-1.1
+ '[' /root/rpmbuild/BUILDROOT/fmram-1.1-15161.x86_64 ']'
+ '[' /root/rpmbuild/BUILDROOT/fmram-1.1-15161.x86_64 '!=' / ']'
+ rm -rf /root/rpmbuild/BUILDROOT/fmram-1.1-15161.x86_64
+ exit 0
#
```

The new package is `/root/rpmbuild/RPMS/x86_64/fmram-1.1-15161.x86_64.rpm`

The source code is available at `/root/rpmbuild/BUILD/fmram-1.1` and can be adapted, modified and rebuilt using Makefile.

This process can be reproduced for the other rpms except for the kernel rebuild which is described here after.

11.3.3 Rebuild the Kernel

The kernel source rpm contains the patch of the drivers and updates required for the Kontron VME/VPX boards.

The steps to rebuild the kernel from the SRPM are quite similar to a standard rpm but note that some other rpms may be required as dependencies:

```
[root@localhost SPECS]# rpmbuild -ba --target x86_64 kernel.spec

Building target platforms: x86_64
Building for target x86_64

error: Failed build dependencies:
    redhat-rpm-config is needed by kernel-3.4.9-15161.ki7.fc16.x86_64
    binutils-devel is needed by kernel-3.4.9-15161.ki7.fc16.x86_64
    newt-devel is needed by kernel-3.4.9-15161.ki7.fc16.x86_64
    python-devel is needed by kernel-3.4.9-15161.ki7.fc16.x86_64
    perl(ExtUtils::Embed) is needed by kernel-3.4.9-15161.ki7.fc16.x86_64
[root@localhost SPECS]#
```

Install missing dependencies (yum repository should be available):

```
[root@localhost SPECS]# yum install redhat-rpm-config binutils-devel newt-devel python-devel perl
perl-ExtUtils-Embed.noarch
    ...
```

Then build the kernel rpms (it takes a while when all rpm options are targeted):

```
[root@localhost SPECS]# rpmbuild -ba --target x86_64 kernel.spec
Building target platforms: x86_64
Building for target x86_64
Executing(%prep): /bin/sh -e /var/tmp/rpm-tmp.o6gFDy
+ umask 022
+ cd /root/rpmbuild/BUILD
+ LANG=C
+ export LANG
+ unset DISPLAY
+ patch_command='patch -p1 -F1 -s'
++ find /root/rpmbuild/BUILD -maxdepth 1 -type d -name 'kernel-3.*'
++ grep -x -v /root/rpmbuild/BUILD/kernel-3.4.fc16
+ sharedirs=
+ :
+ '[' '!' -d kernel-3.4.fc16/vanilla-3.4 ']'
...

Wrote: /root/rpmbuild/RPMS/x86_64/kernel-debuginfo-3.4.9-15162.ki7.fc16.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/kernel-debug-3.4.9-15162.ki7.fc16.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/kernel-debug-devel-3.4.9-15162.ki7.fc16.x86_64.rpm
```

```
Wrote: /root/rpmbuild/RPMS/x86_64/kernel-debug-debuginfo-3.4.9-15162.ki7.fc16.x86_64.rpm
Executing(%clean): /bin/sh -e /var/tmp/rpm-tmp.4VNnf9
+ umask 022
+ cd /root/rpmbuild/BUILD
+ cd kernel-3.4.fc16
 + rm -rf /root/rpmbuild/BUILDROOT/kernel-3.4.9-15162.ki7.fc16.x86_64
+ exit 0
```

The kernel patch for Kontron VME/VPX boards is located at `/root/rpmbuild/SOURCES/linux-3.4.9.2-ki7.patch`.

It contains the specific drivers and aufs patch (required for multinodes-diskless tool).

This patch can be used and port to another kernel version.

11.4 Errata

11.4.1 VME Timeout set by default in the Driver at Infinite - CRP 4286

Description: The VME timeout is defaulty set at infinite. The module parameter '`alma_vmetim`' that corresponds to VME timeout is set at 0. It means infinite VME timeout. The Inifnite VME timeout driver default is to preserve the Kontron Legacy VME. This default parameter value (at 0) can hang the VME bus in some specific use cases.

Workaround: To avoid VME bus issue, we advice the user to append these different `alma_vme` module parameters to the Linux bootline as follows:

```
alma_vme.alma_vmetim=255 alma_vme.alma_pcitim=1
```

11.4.2 VME A24 USER_MBLT and SUPER_USER_MBLT in DMA Mode Accesses does not work - CRP 4287

Description: All access to VME A24 USER_MBLT (AM=0x38) and SUPER_USER_MBLT (AM=0x3c) in DMA mode failed

Workaround: None

11.4.3 VME IRQ Response Time - CRP 4288

Description: VME IRQ response time can have less performance as expected. This problem is mainly due to CPU idle mode on Intel Architecture.

Workaround: Refer to section 7.12.3 “VME IRQ Response Time Improvement” page 63.

11.4.4 LTP Tests failed on VM6052/VM6054 - CRP 4289

Description: LTP test release ltp-full-20140115 has a score of 92.87.
Even if this score is more than correct some fails appeared.

Workaround: None. For more details contact Kontron support.

11.4.5 MTRR Register detected as mismatch in 'dmesg' on VM6052/VM6054 - CRP 4290

Description: This line is present in the dmesg :

```
[    3.377093] mtrr: type mismatch for d0000000,10000000 old: write-back
new: write-combining
```

Workaround: None.

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